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REPORT
OF
OBSERVATIONS
MADE IN THE
BRITISH MILITARY HOSPITALS IN BELGIUM,
AFTER THE
BATTLE OF WATERLOO;
WITH
SOME REMARKS UPON AMPUTATION.

BY
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1816.

TO
FIELD-MARSHAL
HIS ROYAL HIGHNESS
FREDERICK,
DUKE OF YORK,

COMMANDER IN CHIEF OF HIS MAJESTY'S FORCES,

&c. &c. &c.

SIR,

THE anxious and unremitting attention which your Royal Highness gives to whatever concerns the health and welfare, as well as the good order and discipline of the Army, and the pride and interest which your Royal Highness must feel in every thing which has a relation to the glorious

battle of Waterloo, embolden me to submit the following Report to your Royal Highness's consideration. It has been drawn up at the suggestion of the Director-General of the Army Medical Board, and contains the general results of the observations I had occasion to make in examining the condition and treatment of the men who had been wounded in the engagements of the 16th and 18th of June.

In recording the merits of my professional brethren, and in bearing testimony to the singular skill and good management which, under your Royal Highness's auspices, have distinguished the Medical Department of our Army, it affords me the greatest satisfaction to have an opportunity of marking the deep sense of obligation I must ever feel for the gracious manner in which my services have been viewed, by

humbly laying before your Royal Highness
a statement that must prove so highly gratifying to those feelings which your Royal Highness is well known to entertain for the safety and comfort of the British Soldiers.

I have the honour to be,

With the greatest respect,

YOUR ROYAL HIGHNESS'S

Most faithful, most obedient,

and most humble Servant,

JOHN THOMSON.

EDINBURGH, *January 1, 1816.*

CONTENTS.

General State of the Wounded.

Climate and Diseases of Belgium, 5.—Number and Accommodation of the Wounded, 7.—Idiopathic Diseases, 18.—Bilious Remittent and Intermittent Fevers, 19.—Hospital Gangrene, 20.—Kindness and Attention of the Inhabitants of Belgium towards the Wounded, 21.

Of the different Kinds of Wounds.

Incised Wounds, 26.—Punctured Wounds, 28.—Tetanus, 29.—Contused and lacerated Wounds, 31.—The Wind of a Ball, 32.—Gun-shot Wounds, 36.—Hemorrhage, 42.—Secondary Hemorrhage, 44.

Wounds of the Head.

Of the Cranium, 49.—Of the Brain, 52.

Wounds of the Face and Neck.

Of the Face, 63.—Of the Neck, 71.

Wounds of the Chest.

Of the Parietes, 80.—Of the Lungs, 83.—Of the Diaphragm, 93.

Wounds of the Abdomen.

Of the Parietes, 95.—Of the Liver, 98.—Of the Stomach and the Intestines, 102.—Of the Bladder, 108.—Of the Penis and Testes, 111.

*Wounds of the Loins and Pelvis, 113.**Wounds of the Inferior Extremities.*

Of the Hip-joint, 122.—Of the Thigh, 125.—Complicated with Fracture of the Femur, 129.—Of the Knee-joint, 136.—Of the Leg, 139.—Of the Ankle and Foot, 141.

Wounds of the Superior Extremities.

Of the Shoulder, 146.—Of the Arm, 155.—Of the Elbow-joint, 156.—Of the Fore-arm and Hand, 157.

Amputation.

History of Amputation in Military Practice, 159.—Evidence in favour of immediate Amputation, 225.—Amputation after the Battle of Waterloo, 226.—Circumstances requisite for the advantageous Performance of immediate Amputation, 229.—Enumeration of the Injuries in which immediate Amputation is required, 233.—History of Amputation at the Hip-joint, 258.—Instances in which this Operation has been performed, 264, in Belgium 270.—Cases requiring immediate Amputation at the Hip-joint, 274.—Cases requiring the secondary Amputation at that Joint, 278.

REPORT OF OBSERVATIONS,

&c.

GENERAL STATE OF THE WOUNDED.

UPON hearing of the result of the battle of Waterloo, I immediately resolved to proceed to Belgium, that I might have an opportunity of observing the medical and surgical condition of the men who had been wounded in that battle. My friend Dr Somerville, principal medical officer in Scotland, to whom I communicated my intentions, instantly formed the wish of accompanying me thither, and gave me encouragement to hope that the Medical Board would not disapprove of the objects which we had in view, in wishing to visit the different military hospitals in Belgium. We had the satisfaction

to find, on arriving in London, that the Director-General approved warmly of our intentions, and was disposed to afford us every assistance in his power to carry them into execution. Dr Somerville accordingly received a letter from the Medical Board, accepting his offers of service, and containing instructions and recommendations with regard to me, in every respect calculated to procure the opportunities of observation which I so much desired.

We left London on the 4th, and arrived in Brussels on the 8th of July ; and, conformably to the instructions which he had received, Dr Somerville reported himself, and introduced me, to the senior medical officers there, Mr Gunning and Dr M'Niel. We made known to these gentlemen our desire to visit the different military hospitals under their charge, and to have an opportunity of observing the condition of the wounded whom these hospitals contained. They received us with the cordiality of friends, entered readily into our views, and introduced us without delay to the other officers who composed the Medical Staff at Brussels. By these officers we were every where received with the most flattering marks of attention ;

they did every thing in their power to forward our examination of the wounded ; and, by their frank, open, and liberal communications on the individual cases of their patients, facilitated greatly the attainment of the objects of our inquiry.

In stating the results of our observations, it would be foreign to my purpose, to take any notice of the military operations of the battle of Waterloo. The super-eminent talents displayed in that action by the Commander, and the determined resolution and bravery with which our troops withstood and repulsed the incessant attacks of the enemy, will afford to the historian, subjects which must gratify the pride, and excite the emulation of Britons, to the latest posterity.

But the duties of the medical man, to whom the charge of those wounded in battle is committed, though less brilliant in the eyes of the world, are often not less dangerous to himself than the exertions of the warrior, nor less deserving of public esteem and reward. The fatigue, anxiety, and disappointments to which he is subjected, can be conceived only by those who have experienced them. The gratitude of

his patients is the fruit of his success, and sometimes the reward of his labours ; but in meeting with neglect, or ignorant censure, how often is this useful servant of the public obliged to be satisfied with the silent approbation of his own heart, as his only recompense for the utmost endeavours of his skill and humanity.

It gave Dr Somerville and me much satisfaction, during our stay in Belgium, to perceive the zeal with which the medical officers were everywhere animated, in the discharge of their respective duties, and the generous emulation which seemed to prevail among them, to alleviate, as far as could be done by judicious arrangements, and professional skill, the sufferings of the brave and gallant men, who were placed under their care. Indeed, it was impossible to visit the hospitals in the particular manner we did, without being gratified in an extreme degree, by the diligence of those officers, and by their humane attention to the wants, comforts, and desires of their patients.

That part of Belgium which had been so lately the theatre of war, and where our wounded men were necessarily stationed after the battle of Waterloo, is very little elevated above the

level of the sea. The higher and dry parts of the country are in general very healthy ; but in the lower, flat, wet, and marshy districts, the inhabitants are subject to fevers, which prevail epidemically towards the end of summer and the beginning and middle of autumn. It is well known, that these fevers begin earlier or later, are of shorter or longer duration, and are attended with milder or more alarming symptoms, according to the various degrees of heat and moisture of the season, according to the greater or less stillness of the atmosphere, and also according to the degree and continuance of exposure to the air, which stagnates or moves slowly over the low, marshy, putredinous ditches, and over the oozy beds of the rivers, with which that country abounds.

Sir John Pringle has remarked, that “ when the heats of summer come on soon, and continue throughout autumn, without being moderated by winds or rain, the season proves sickly, and the fevers appear early, and are dangerous ; but when the summer is late, and tempered by frequent showers and winds, or if the autumnal colds begin early, the fevers are few, their symptoms mild, and the cure easy.”

“The epidemic of autumn, and prevailing distemper of this and other marshy countries, is a fever of an intermitting nature, commonly of a tertian form, but of a bad kind, which, in the dampest places, and worst seasons, appears as a double tertian, a remitting, a continued putrid, or even an ardent fever; all which, however, though varying in their appearance according to constitution, mode of life, and other circumstances, are yet of a similar nature. For though, in the beginning of the epidemic, when the heats are greatest, the fevers assume an ardent and remitting form, yet, by the end of autumn, they usually terminate in regular intermittents.” The disease may be kept up, and it is often much aggravated, by an excessive secretion of bile, and hence the name which it has obtained in some districts of Belgium, of the Gall Sickness.

Cholera Morbus and Dysentery, though seldom epidemic, are to be ranked among the diseases of this moist country. In particular seasons, the dysentery has been known to be extremely severe, and to attack the natives as well as those foreign troops, which it has been

the fate of Belgium for centuries, to have stationed in her territories.

The battle of Waterloo was fought about four or five weeks before the usual commencement of the sickly period in Belgium. The troops, at the time of the battle, were in a very healthy condition; and, except those who were wounded, continued so, during their march to Paris.

It appears from the official statements, that, of the British army, nearly 2000 were killed, and 8000 wounded, in the battles of the 16th and 18th of June. In consequence of the great number of the wounded, some days were required for their removal from the field, and their conveyance to Brussels. Here accommodation was found in the hospitals and private quarters for the greater part of them. Those who could not be accommodated in Brussels were sent by the canal to Antwerp. The weather had been very rainy and stormy during the 17th and 18th; but it did not appear that the men had sustained any injury from their exposure to it. Even those of the wounded who had been necessarily left, some for one, two, or even three days, did not appear to have suffered in

any respect from the privations and exposure to which they had been subjected.

In a battle so obstinately fought, and in which so many were wounded, it was impossible that the medical officers could give to every man the immediate attention which his particular case might require; but in overtaking this distracting and painful duty, the most indefatigable exertions were made, both on the field and in the hospitals into which the wounded men were received. The labours of these officers were continued without intermission for several days and nights, leaving them scarcely an interval for refreshment, and none for repose. To appreciate the value of such labours, one must have been present at the horrors of the scene in which they were engaged, must have heard the groans, and seen the agonies of the dying; and, what is still more painful to endure, must have listened to the cries, without having it in his power to relieve the sufferings, of the wounded. Several of these officers confessed to me, that the sight of so much misery as presented itself after the battle of Waterloo, rendered them indifferent to life; and that, in the state of intense excitement in which they

were for some days, they lost all recollection of, and regard for, themselves.

Besides the very great number of our own wounded men who required to be taken care of, several thousands of the French, most of them severely wounded, were left behind upon the field of battle, or in the route of their flight. These men were gradually collected, and some of them sent to Brussels, others to Termonde, but the greater part to Antwerp. Most of those who had been but slightly wounded, had effected their escape; and many, with even severe wounds, had concealed themselves in the houses of the inhabitants of the districts through which they passed. Several must have died in these situations; and of those who were found, and afterwards brought into Brussels, the wounds were generally in a bad condition, and those who had suffered them, affected with fevers. These circumstances, joined to the great depression of spirits which was the natural consequence of so signal a defeat, tended much to increase the number of deaths which occurred among the wounded French.

On our arrival at Brussels, we found the wounded non-commissioned officers and pri-

vates under the care of the British Medical Staff there, amounting to upwards of 2500 men, collected into six hospitals. Five of these hospitals, the Jesuits, Elizabeth, Annonciate, Orpheline, and that of Notre Dame, were situate in the higher and more healthy parts of the town ; the hospital, containing the French prisoners, in a building formerly occupied as a barrack by the Gens-d'armerie, being in a lower part of the town, was more unfavourably placed. In all of these hospitals, a few cases of the bilious remittent and intermittent fevers of the country were to be observed, and these cases were more severe, and, proportionally, more numerous in the Gens-d'armerie than in any of the other hospitals, owing, partly perhaps, to the low situation of this hospital, but chiefly, I believe, to the circumstances that the wounds were in general of the very worst kind, and that many of the men, previously to their admission, had caught this fever in the low, damp houses and marshy situations, from which they had been gradually collected.

The first period of inflammation, and of the symptomatic fever by which it is usually accompanied, was over, in a considerable number

of the wounded, before our arrival at Brussels, and we had an opportunity of observing only the subsequent progress of these affections, in those who had survived or recovered from their first and violent attacks. The symptomatic fever, in the greater number of instances in which we had occasion to see it, put on much of the appearance of a bilious remittent or continued fever, proving clearly to my mind, that the type or form of that fever was modified by the situation and climate in which it occurred. It deserves particularly to be remarked, that this fever had begun to prove fatal by the seventh day after the battle, and continued to be so till the twenty-first day, when the number of deaths suddenly became fewer.

Twelve days were required to enable us to make a full examination of the wounded, who were collected in the hospitals in Brussels. In proceeding to Antwerp, we visited by the way an hospital at Termonde, containing about 250 wounded French prisoners. A considerable number of these men were affected with the fevers of the country, which not unfrequently assumed the form of a double tertian. Those affected with this fever had a white furred but moist

tongue, and a remarkably sallow complexion. Dr Perkins, the British medical officer, who had the charge of this hospital, informed us, that, after proper evacuations had been made, he found the arsenical drops of Fowler more useful than the bark in the cure of the intermittents at Termonde.

At Antwerp we received the same kind and friendly attentions from all the officers of the Medical Staff which we had experienced at Brussels. Mr Higgins, the principal medical officer, was indefatigable in his endeavours to promote the objects of our visit; and by the promptitude and excellence of his arrangements, contributed much to facilitate the examination of above 2500 men, who were placed under his superintendence. The hospitals in which these men were accommodated were five in number, the Minimes, Facon, Augustines, Hotel du Nord, and the Corderie. This last, a new building situate along the right bank of the Scheldt, in an open airy situation, and intended for a rope-work to the naval arsenal, was fitted up for the reception of the French prisoners. It was nearly a quarter of a mile in length, and contained upwards of 1000 men,

most of them severely wounded, who were all lodged in one large apartment, occupying the whole of the first floor. The other French prisoners, who could not at first be received into this hospital without crowding it, were placed in the church of the Jesuits, and in a suite of public rooms opposite to it, known in Antwerp by the name of the *Sodalité*. The wounded French at Antwerp, though subject to the general direction of the British, were more immediately committed to the care of the surgeons of that town, acting under the inspection of Dr Vranken. Dr Somerville and myself were much indebted to this intelligent practitioner, for his endeavours to facilitate our examination of the wounded, and for many other civilities of a professional kind, during our visits to Antwerp.

The very low situation of Antwerp, and the state of the weather, which had become very warm, were rather unfavourable to recovery. We were accordingly prepared to see, and did observe, that the surfaces of the wounds and sores in the hospitals had a less healthy appearance, than those of the men we had left at Brussels. They manifested a tendency

to sloughing, and had evidently passed, or were many of them passing, into that state which is well known to medical men by the name of Hospital Gangrene. Besides this greater tendency to sloughing in wounds, we found also that the bilious remittent and intermittent fevers of the country had begun to attack the convalescents in the hospitals, and that a bilious symptomatic fever had been very severe, and, in some instances, had even proved fatal to those who had undergone either primary or secondary operations.

In many of those who laboured under continued bilious fever, as well as in the severer cases of the symptomatic fever, succeeding to wounds and to operations, the skin became of a colour so yellow as to give to those affected with these fevers the appearance of jaundice. We did not hear of any of the patients, in whom this yellow state of the skin occurred, having been affected with black vomiting. The absence of this symptom, however, was perhaps the only circumstance in which this affection differed from the disease which has been often described under the name of Yellow Fever. In general, no obstruction

or other disease of the liver could be perceived, on examination after death, of the bodies of those in whom this yellowness of the skin had taken place.

On finishing our review of the wounded at Antwerp, we returned to Brussels on the evening of the 29th of July, and were employed for eight days in examining the progress towards recovery, which had been made during our absence. The cases of fever which now presented themselves to our notice, were in general of an intermittent and mild form, though in several instances here, as well as at Termonde and Antwerp, bilious fever, in its continued and most aggravated form, had supervened in twenty-four hours after amputation, and other severe operations. The hospital sore, which did not exist in Brussels when we left it, had made its appearance in the lower wards of some of the hospitals. A few men affected with dysentery had been admitted into the Orphelines. They belonged to the carriage department, and had slept out in the open air, in the low marshy grounds near to the great canal, where their waggons were placed. But this disease was not communicated, as far as we could learn, to any

of the other men who were lodged in that hospital. Several patients had died of hectic fever, a considerable number had been dismissed fit for service, and the greater part of those remaining seemed to be in a state of convalescence.

We set out for Antwerp a second time on the afternoon of the 7th of August, and on our arrival were happy to find that the rains which had taken place had cooled the temperature of the air, and appeared to have had a beneficial effect in arresting the progress both of the fever and gangrene. There can be little doubt, that in most situations, the sloughing and gangrenous hospital sore is of an infectious nature. In Belgium, however, it appeared to us to be endemial, and to prevail most in those situations and hospitals where the fevers of the country were most numerous and severe. It is singular that no mention is made of this affection in the writings of Sir John Pringle. A description of hospital gangrene, such as he must have had many opportunities of observing it, seems alone wanting to complete his invaluable and accurate account of the air and diseases of the Low Countries. Hospital gangrene, though a less fatal, is not, to the army or navy,

a less formidable disease than fever or dysentery.

We found, that a great number of the English, whom we had formerly seen at Antwerp, had been cured and discharged; that some of the more severely wounded, whose situation admitted of it, had been removed to England, and others with slighter wounds sent back to Brussels. The remainder from the Minimes, the Augustines, and the Hotel du Nord, were collected into the largest and most convenient hospital, the Facon.

The remainder of the wounded French were collected into the Corderie, and did not now exceed four hundred. A considerable number had died of their wounds; but the greater part had recovered, and had been sent, some to Dunkirk, and others to England. Several cases of the bilious fever in the continued form had occurred in this hospital. This, the synochus putridus of the continental writers, is to be considered, I conceive, as an aggravated state of the bilious remittent or intermittent fever. The hospital gangrene, which, during our first visit, was confined to the two extremities of this hospital, had now spread to the patients in the

middle divisions. It seemed to be unaccompanied with fever, or any other great derangement of the general system.

No contagious fevers existed in any of the hospitals in Brussels or Antwerp, nor did any such make their appearance in them during our stay in Belgium. The great attention which we saw every where given to cleanliness and to ventilation in the British hospitals, must undoubtedly have had a powerful influence in preventing the occurrence of contagious diseases. The habits also and discipline of our troops, in regard to personal cleanliness, and the pains which were taken to remove every kind of impurity from the wards in which the wounded men were laid, must have contributed greatly to the same purpose. That in the management of hospitals, civil and military, the preservation of cleanliness is to be regarded as the first and most imperious of duties, is a truth which has been established by universal experience. Indeed, without a constant and unremitting attention to this duty, the advantages to be expected from the exertions of the skill and humanity of medical officers, must be greatly impaired, if not wholly frustrated.

From this very general statement, it ap-

pears that only two diseases, independent of the symptomatic affections proceeding from wounds, could be said to prevail in the Belgian hospitals, the Bilious Remittent or Intermittent fevers of that country, and Hospital Gangrene. The symptoms, varieties, complications, and treatment of the former of these diseases, have been so ably and so fully treated of in the writings of Tissot, Stoll, Home, Grainger, Pringle, Elsacher, and other authors, that I deem it unnecessary to offer any observations with regard to them. I shall merely remark, that it seems now to be very generally agreed among those who have had much experience in the treatment of these fevers, that they not unfrequently partake, in their commencement particularly, of an inflammatory nature, and of course that blood letting, purgatives, and diaphoretics, are necessary in the first, while bark, stimulants, and nourishing diet, are admissible only in the latter stages.

The Hectic, or secondary symptomatic fever, as well as the primary symptomatic, or inflammatory fever, with which the wounded were affected both at Brussels and Antwerp, had a bilious character; and, in many instances, it

was extremely difficult to distinguish it from the remittent and intermittent fevers of the country. To us it appeared, that the best diagnostics between these two fevers were to be derived from the furred state of the tongue, and the peculiarly oppressive sensations, which occurred in the epigastric regions of those affected with the remittent or intermittent fever.

Hospital Gangrene is a disease of which I have endeavoured to give an account in my printed Lectures on Inflammation. In the cases in which I have seen this disease occur in Britain, it has appeared to be of a contagious nature. I am doubtful, however, whether it was ever communicated from one patient to another, in the hospitals in Belgium, and am rather inclined to believe that it was endemial, and depended on the same causes as the fevers of the country. At Antwerp, this affection was much more prevalent than at Brussels, from which it differed as well as from that which I had seen in Britain, in this remarkable circumstance, that it was almost universally unaccompanied by fever, or by marks of great topical inflammation. The blood letting, therefore, which was proper and necessary, in a considerable pro-

portion of the cases of hospital gangrene which occurred at Brussels, was not required in the cases occurring at Antwerp. The application of caustic substances, such as the strong mineral acids, the solutions of potass, of corrosive sublimate, and of arsenic, &c., seemed at Antwerp to arrest the progress of this sore, without exciting inflammation. At Brussels, where it had more of an inflammatory character, milder applications, such as the common and carrot poultices, were in general found to answer better than the more stimulating substances. I had no opportunity of seeing the effects that result in this disease from the application of the actual cautery, a remedy which has been so much, and, I believe, justly, extolled by French surgeons, formerly by Pouteau and Dusassoi of Lyons, and more recently by Delpech of Montpellier.

It would be unjust to the inhabitants of Brussels and Antwerp, to pass over in silence the humane and laudable attentions which they gave, both in public and in private, to our wounded men. From the commencement of the engagements, the deepest interest had been felt by the Belgians in the success of the Bri-

tish, and the heroism which had delivered them so suddenly, by a victory so decisive, from the terrors of invasion, excited in their minds the strongest emotions of admiration and sympathy. For some days after the battle, the inhabitants of Brussels, the city nearest to the scene of action, devoted themselves entirely to the care of the wounded, gave to them every assistance in their power, and were eager to receive them into their houses. On the day after the battle, as I have been informed by a very intelligent eye-witness, the streets and squares presented a most singular and interesting spectacle. The shops were shut, the people were at their doors administering cordials, and offering dressing to the wounded, taking the tenderest care of them. The most delicate females, and people of all ranks, were occupied in this manner. Hundreds of wounded were to be seen in the streets, and some were to be found in every house. Even after the hospitals were fully established, several hundreds of privates, beside the officers, were voluntarily received and taken care of by the inhabitants during their cure. In the course of our visits to wounded officers, in private quarters, we had frequently occasion to

observe the sacrifices which the inhabitants cheerfully made of their accommodations and comforts to their wounded guests, the personal services which they rendered, and the kindness they showed in presenting them with wine, fruit, and other luxuries. That this kindness proved injurious, in some instances, by interfering with the regimen and medicines prescribed by the medical officers, cannot be denied; and on this account it sometimes became necessary to discourage acts of benevolence which had the relief and comfort of the wounded solely for their object.

It is impossible, we conceive, for wounded men to have been better lodged, or more amply supplied with every thing necessary for their situation, than those whom we visited in Belgium. The wards of the hospitals in which they were placed, were large and well-aired, their beds, in general, excellent, and the supply of bed-clothes such as to allow of their being changed as often as necessary. Provisions of every kind were good, cheap, and abundant. The season was sufficiently advanced to afford a supply of agreeable and wholesome fruits, and seemed, by its unusual coolness, to aid the kindness of

the inhabitants, and the exertions of the medical officers, in mitigating the sufferings and calamities which are necessarily occasioned by war. The wounded themselves, were bearing, and had borne from the first, their sufferings with a fortitude and patience worthy of the heroes who had fought and conquered in the battle of Waterloo.

OF THE DIFFERENT KINDS OF WOUNDS.

BEFORE our arrival in Belgium, considerable pains had been taken in different hospitals to arrange and to bring together, as nearly as possible, injuries of the same, or of a similar kind. In every situation admitting of it, the placing of similar cases near to each other in hospitals, is useful to the medical attendants, by the facility which it affords of observing the circumstances in which such cases may happen to agree or to differ. That comparison of cases also, to which this arrangement naturally enough leads, is extremely beneficial to patients, by the increased attention which it excites, and by the interest which it gives even to minute and apparently trifling, though often really important, particulars, in the history and treatment of individual cases.

Wounds have been distinguished by practical writers into different kinds, from the form of the weapon with which they are inflicted, and from the region of the body in which they occur. To the first division belong incised, punctured, contused, lacerated, and gun-shot wounds; to the latter, wounds of the head, face, neck, chest, belly, and extremities. Of all these different kinds of wounds, numerous examples presented themselves to our notice.

Incised Wounds.

THE incised wounds which we saw had been inflicted by the sabre. They were found chiefly among the French prisoners at Antwerp, and were for the most part upon the upper region of the head, or upon the temples, face, back part of the neck, and shoulders. In consequence of the retraction of their edges, many of these wounds presented very frightful appearances.

It is a point now very generally agreed among English surgeons, that an attempt ought to be made to heal every clean cut and incised wound by the process of adhesion. But this practice

is far from being universally adopted by French surgeons. Even some of their latest and best authors would endeavour to persuade us, that it is impossible to do this, and that, if it were possible, the practice must have injurious effects. Indeed, the adhesive strap, so useful in the healing of wounds and ulcers, has been hitherto comparatively but little used by the continental surgeons. Almost all recent wounds, especially those made by operation, are filled with lint, and the edges are kept asunder by this substance in some instances, even long after the process of suppuration has commenced. I have been surprised to see the practice of stuffing sabre wounds persisted in, till the growth of granulations, and the occurrence of cicatrization rendered it impossible to continue it any longer. If English surgeons err, as I am afraid they sometimes do, by applying too much adhesive plaister to the surfaces of wounds, and by leaving no interstices for the escape of pus and other fluids, the French certainly lose a great deal of time, and often occasion an unnecessary degree of pain, by the indiscriminate use which they make of dry lint. Each mode of dressing wounds, that by the

strap, and that by the lint, has its peculiar advantages ; but those of the strap have always appeared to me to predominate.

The Stitch, which was at one time so much used in the healing of incised wounds, has of late years been almost altogether abandoned. That it was sometimes injurious, I will not pretend to deny ; but I am persuaded, that it was often extremely useful, and that it might have been so, had it been employed, in a variety of the sabre wounds which we saw treated by the continental surgeons.

Punctured Wounds.

OF the punctured wounds which we saw, the greater part had been inflicted by the lance, and a few only by the bayonet. In piercing the body, the lance cuts more than the bayonet, and, by the greater hemorrhage which it occasions, it is probably more deadly in its first effects. The lance-wounds in general healed very readily, much more so than those made by the bayonet, and with less severity of local and constitutional symptoms. Yet even in the healing of these

wounds, we had frequent occasion to observe the extension of inflammation along the continuous textures from the original seat of the puncture, and the formation of matter under fasciæ,—two of the most remarkable local phenomena which occur in the progress of punctured wounds. The symptomatical fever in these cases was always severe, and usually of a bilious character.

It is well known that punctured wounds are liable to be followed by an attack of tetanus or locked-jaw; but the number of those affected with that disease was very inconsiderable, and in the greater proportion of instances in which it had occurred, it appeared to be of a chronic or mild character. This is a form of tetanus in which recovery often takes place without much aid from medicine. But in the acute and severer cases of this disease, we have yet, I believe, to learn whether a cure be ever actually produced by the use of remedies; for how seldom in such cases has the use of the most approved of these remedies been followed even with a temporary alleviation of symptoms. The application of the actual cautery is the remedy which has been last and most strongly recom-

mended. M. Larrey, to whom we owe the discovery of this remedy, speaks of it, in the third volume of his Military Memoirs, in terms of the highest approbation. With this author the cautery seems to have superseded the use of the blisters, incisions, and amputations, which he formerly so strongly recommended. How long he may continue to repose confidence in the application of the cautery, or how soon he may discover a better remedy for the cure of tetanus, it may be difficult to conjecture ; but one thing is certain, that the effects which he has related, as resulting from the application of this remedy, are so sudden in their appearance, so marvellous, and so unlike what have been observed in the supposed cure of this disease by other practitioners, that, but for M. Larrey's great authority as a military surgeon, one would have difficulty in giving credit to them.

Contused and Lacerated Wounds.

The contused and lacerated wounds which came within our observation, had been occasioned by cannon-balls, by cannister shot, and

by pieces of bombs. The appearances and effects of these wounds are known to vary exceedingly, according to the velocity, the form, and the size of the body which impinges, and also according to the structure and functions of the part which receives the impulse. In the soft parts, numbness, pain, extravasation of serous or bloody fluids, inflammation, gangrene, and complete mortification, may be immediately produced by contusion; or the vitality of the hard parts may be partially or wholly destroyed by the impulse of the contusing body, and inflammation, ulceration, and exfoliation of bone, occur at periods more or less remote from the time of the injury.

It is to the class of injuries occasioned by contusion, that those deaths have usually been referred, that are said to have arisen from the wind of a ball. The cause of these deaths, however, has been more satisfactorily explained by Vacher, in his excellent Memoir upon this subject, who supposes that some of the great cavities of the body had been struck by a spent ball, with a force sufficient to contuse, or even rupture, some of the organs contained in these cavities, without occasioning

any external marks of injury. Whether any of the effects which have hitherto been ascribed to the wind of a ball, are referable, as Mr Ellis has suggested, to electricity generated by the passage of balls through the air, is a point to be ascertained by experiment. In the cases which have been recorded of injury or death produced by lightning, marks of burning have usually been observed ; but I am not aware that any such marks have ever been observed on the bodies of those supposed to have been killed or injured by the electricity of balls. It were to be wished that the intelligent author of this hypothesis would prosecute the subject experimentally, with the same care and scientific accuracy which he has so successfully employed in the investigation of subjects of much greater difficulty. Can it indeed be, as the poet long ago imagined, that a leaden bullet attracts heat to itself in passing rapidly through the air ?

“ *Obstupuit forma Jove natus ; et æthere pendens
Non secus exarsit, quam cum Balearica plumbum
Funda jacit : volat illud, et incandescit eundo :
Et, quos non habuit, sub nubibus invenit, ignes.*”

If so, what are the degrees of the accumula-

tion of the electric fluid, the circumstances in which it is generated, and the effects which it is capable of producing? We saw, and were informed of, many instances in which cannon-balls had passed quite close to all the parts of the body, and had removed portions of the clothes and accoutrements, without producing the slightest injury of any kind. In other instances, portions of the body itself were removed by cannon-balls, without the contiguous parts having been much injured. In one case, the point of the nose was carried off by a cannon-ball, without respiration being at all affected; and, in another very remarkable case, the external part of the ear was shot away, without even the power of hearing being sensibly impaired.

One of the more singular phenomena of contused and lacerated wounds, is the stop which is sometimes put to the flow of blood through the larger arteries. It has long been known that a limb may be torn or shot off, even near to the trunk of the body, and yet little, if any, hemorrhage, be produced. We saw a man whose leg had been shot off by a cannon-ball; in amputating his limb above the knee, the arte-

ries of the thigh were not perceived to bleed, nor did any of them afterwards require to be tied. A case similar to this, also presented itself, in which the arm had been shot away, close to the shoulder joint. In a dissection which I saw made by Deputy-Inspector Guthrie, of a limb cut off in consequence of a mortification of the foot and leg, produced by a contusion from a cannon-ball on the posterior part of the leg, the popliteal artery was found closed in the lower part of the ham by coagulable lymph, which seemed to have proceeded from a rupture of the internal coat of the artery. About two inches below this closure, the tibial and peroneal arteries were fairly torn across, and opened into a large abscess, which was filled with a bloody sanies. The rupture of the internal coat of the artery, and the closure of the canal in the part where the rupture had taken place, bore a very striking resemblance to the appearances very fully detailed in the history of a case published in the Appendix to Mr Hodgson's late work upon Aneurism ; but in that case the rupture of the internal coat was spontaneous, and not, as in this, the effect of external violence. Mr Guthrie mentioned to me a very interesting

case which had occurred to him in Spain, in which gangrene of the foot and leg supervened to a wound made through the middle of the thigh by a musket-ball. On this case terminating fatally, it was found by the dissection of the limb, that the bullet had passed between the artery and the vein, and that the artery was closed by a coagulum above and below the place where the bullet had passed. I have myself seen two cases in which the pulsations at the wrist ceased, in consequence of the passage of balls through the lower and fore part of the arm, near to the brachial artery ; and two cases in which the pulsations of the temporal arteries were stopt by balls passing across the region of the ear. In none of these cases was the hemorrhage such, as to induce me to believe that the arteries had been divided. The closure in these instances may have been produced either by the rupture of the internal coats from the impulse of the ball, or by the communication of inflammation from the canal of the wound to the arterial tube. In this latter way I have seen the permanent closure of the arterial tube produced in the arteries of the Dog, by exciting inflammation in their external coats.

Gun-Shot Wounds.

By far the greater number of the wounds, which we saw, had been produced by musket-balls, and were consequently of the kind that are denominated Gun-Shot. These wounds, even in their simplest state, are often very difficult to heal. This seems to arise from their partaking of the nature both of contused and of punctured wounds. Like punctured wounds they have narrow openings; like contused wounds, they are usually at first attended by only a very slight degree of hemorrhage, and with but little pain. In gun-shot, as in contused, wounds, a portion of the parts through which the ball has passed may be more or less deprived of its vitality. It is this state of those wounds which seems to prevent them from healing by the process of adhesion.

We saw many examples of the singular directions which balls often take in their course through different parts of the body. Indeed, nothing can be more difficult, than from the place of the entrance and exit of a ball, to judge what the parts are which it has injured

in its passage; or if it has entered, but has not passed out, to ascertain, from the position and apparent direction of the wound, the place where it is lodged. It has long been known, that balls may pass round almost any part of the body immediately under the skin, without penetrating into the subjacent parts, or entering the three great cavities of the head, chest, or belly. Several cases occurred among the wounded, in which, from the appearances that presented themselves upon examination after death, I am induced to believe, that balls, which have entered these cavities, may take the concave direction of the internal surface of their parietes, and run for a considerable way between these parietes, and the viscera which they contain. This is a point which, I hope, the observations of my friend, Deputy-Inspector Hennen, will amply confirm and illustrate.

It is well known, that it is no uncommon thing for a ball, in striking against the sharp edge of a bone, to be split into two pieces, each of which takes a different direction; sometimes it happens that one of the pieces remains in the place which it struck, while the other

continues its course through the body. Of a ball split by the edge of the patella, I have known one half pass through at the moment of the injury, and the other remain in the joint for months, without its presence there being suspected. In the same manner, I have known a ball divided in striking against the spine of the scapula, and one portion of it pass directly through the chest from the point of impulse, while the other moved along the integuments, till it reached the elbow-joint. But the most frequent examples of the division of bullets which we had occasion to see, were those which were produced by balls striking against the spherical surface of the cranium. It sometimes happens that one portion of the ball enters the cranium, while the other either remains without, or passes over its external surface. Not unfrequently in injuries of the cranium, the balls are lodged between its two tables, in some instances much flattened, and altered in their shape, and in other instances without their form being changed. Where the balls have been shot into the extremities of the long bones, they often receive the impression of the cellular structure of these bones. In every instance

in which a ball strikes against a bone, even if the wound should have two orifices, it must be doubtful whether a division of the ball has not been occasioned, unless the ball itself is found, so that it may be seen whether it be or be not divided.

No fear is now entertained either by medical men or soldiers, of any kind of poison being introduced into the body by means of musket-balls. All the consequences, immediate and remote, to which these balls give rise, are justly referred to the contusion, laceration, and division, occasioned by their impulse. Accordingly, surgeons now no longer think it necessary to dilate, cauterize, or suck such wounds, for the purpose of destroying or extracting poison.

Many of the missile weapons employed by the ancients, when received into the body, required the incision of the soft parts surrounding them, before they could be extracted ; and this was the case not only with regard to darts and arrows, but also with regard to bits of stone, pieces of iron, and leaden bullets, which they were accustomed to discharge at their enemies by means of slings. Celsus mentions the ne-

cessity of enlarging the orifices through which these bodies had entered, in order to facilitate the extraction of the foreign body, and may therefore be justly regarded as the first who recommended the practice of dilatation in the treatment of the wounds made by leaden-bullets.

In the progress of the knowledge of gun-shot wounds acquired by the moderns, it became, with most military surgeons, a rule to dilate by incision the orifices of all gun-shot wounds, and this even in those cases in which the balls had passed through and out of the body, as well as in those in which they were lodged. Various reasons have at different times been given for this practice, scarcely any of which are now regarded as satisfactory by military surgeons. The injuries arising from the practice of indiscriminate dilatation, were very early pointed out by Botallus; and it is singular, how much the opinions of this author, with regard to this point in military surgery, coincide with those of Mr Hunter. But no author, with whose writings I am acquainted, has stated so distinctly as Mr Hunter has done, the cases which require the immediate dilatation of the orifices of gun-shot wounds, and those circumstances which render

dilatation necessary and proper in the subsequent progress of these injuries.

From the rule, which was certainly too indiscriminate, to dilate in every case of gun-shot wound, we are probably passing into the other extreme, of dilating but seldom, if at all. That practice, however, is indispensably necessary in cases in which it is proper to expose to view and tie a bleeding artery, and it may be extremely useful, whenever it can lead to the discovery, or facilitate the extraction, of foreign bodies of any kind.

It were perhaps to be wished that the Medical Board would give out a prize essay on the subject of dilating gun-shot wounds, and propose the soundness of Mr Hunter's opinions as the basis of the discussion. I am convinced that military surgeons will find some exercise for their ingenuity in assigning different or better reasons for the immediate and for the remote dilatation of gun-shot wounds, than those which have been given by Mr Hunter, and some difficulty also in improving his enumeration and analysis of the cases in which these dilatations are required, or may be omitted.

Great pains should be taken to discover and ex-

tract a ball which is lodged, at the first dressing of a gun-shot wound, partly, perhaps, because this is a point to which the patient and his friends are always disposed to attach much importance, but chiefly because, at this time, the attempts to discover and extract balls can be made with more hope of success, and with less pain to the patient, than at any other period. Surgeons, however, are well aware that the ball is, of all foreign bodies, the one the presence of which in a wound needs give them the least anxiety; for innumerable are the instances upon record in which balls have been known to remain in different parts of the body for months, or even years, without producing the slightest degree of local uneasiness, or other injury.

Hemorrhage.

Hemorrhage is the great source of immediate danger in wounds. It is probably from this that most of those die who are killed upon the field of battle. But besides the immediate loss of blood which necessarily results from the division of the blood-vessels by a wound, and which

requires the speedy interference of the surgeon, there are various other kinds of hemorrhage, which, if misunderstood or neglected, may have a fatal termination.

There is, perhaps, no part of surgery which of late years has been more improved than that which relates to the proper management of the means to be employed for the suppression of hemorrhage. Surgeons now venture, with ease to themselves, and safety to their patients, to lay bare and apply ligatures to arteries, which, a few years ago, it was regarded as extremely improper and hazardous to tie. The small, but strong ligature that is at present used, is applied so as to include the artery alone, which not only ensures the complete closure of the artery, but also facilitates greatly the subsequent separation of the ligature.

The continued application of the tourniquet for the suppression of hemorrhage from the arteries of the extremities, which almost always occasioned a mortification of the limb to which it was applied, is now seldom had recourse to, even for the purpose of temporary suppression, unless by ignorant or timid surgeons. Pressure with the finger, or with pads, over the course

of the larger arteries of the groin or axilla, having been found to be a more easy, speedy, and efficacious means of suppressing hemorrhage than the tourniquet, is now generally employed in cases where it is conceived necessary to lay bare and tie the trunks of the femoral or brachial arteries. Where the propriety of laying bare these trunks is doubtful, surgeons now substitute pressure by compresses of sponge or lint, fastened down by a roller, firmly applied from the points of the extremities. This mode of compression, when properly applied, admits of circulation through the limb, while the tourniquet admits of none.

Secondary hemorrhage may take place at very different periods, and from several causes. It may take place from the forcing open of the recently closed mouths of arteries which have been divided, by an increased determination of blood to the part which has been wounded. This variety of hemorrhage usually occurs from the first to the fifth day.

Secondary hemorrhage may also take place from the sloughing of the coats of arteries injured by contusion, a circumstance of very frequent occurrence in gun-shot wounds. This

variety of hemorrhage usually happens from the fifth to the tenth day.

Secondary hemorrhage may be produced by ulceration of the coats of arteries, which may occur at any period during the existence of a wound. I am inclined to believe that the hemorrhage which occurs before the tenth day, takes place more frequently from the sloughing of arteries, than from their ulceration. But in many instances, these two processes are combined, and it is then difficult to determine the share which each of them has respectively had in the production of the hemorrhage.

There is also a species of secondary hemorrhage which occurs in wounds, that comes on usually at a later period of their progress than those varieties which have been already mentioned. I allude to a species of secondary hemorrhage which I have repeatedly seen occur from the extremities of stumps after amputation, and from the canals of gun-shot wounds. This hemorrhage usually takes place from the twentieth to the thirty-fifth day, though, in particular instances, it may occur earlier, or even later than this period. It is always preceded by heat, pain, and throbbing in the sur-

face from which it proceeds, and has taken place in the greater number of instances in which I have observed it, in persons of a sanguine or plethoric temperament, after indulgence in the use of a nourishing or stimulating diet. This variety of secondary hemorrhage bears, in almost every respect, a strong resemblance to those spontaneous hemorrhages which take place from the capillary vessels that open every where upon mucous surfaces. It seems in general to be produced by the same causes with those hemorrhages, and may be prevented or alleviated by the same antiphlogistic methods of treatment. In the dissection of the wounds and stumps of those who had died of this hemorrhage, I have not been able to detect, even with the aid of injections, the vessels from which the blood had been poured out in great profusion before death. It seems to me to have been this affection to which M. Le Dran has alluded in his description of "Pulsations which patients sometimes feel in their wounds."

The first period of secondary hemorrhage, or that which occurs from the second to the twelfth day, was over before our arrival at Brus-

sels ; but we were informed of a number of cases in which hemorrhage, during this period, had actually taken place from wounds in all parts of the body, and of several instances in which it had suddenly proved fatal. From notes in my possession, of above fifty cases of secondary hemorrhage which had occurred among the wounded in Belgium, it appears, that in the greater number of these cases, it took place after the twentieth day ; but I am doubtful whether this be the proportion in which such cases usually occur. I have no data by which to determine accurately, from what causes the hemorrhage proceeded in those cases in which it occurred before the twentieth day, though, from several circumstances related to me, I am inclined to believe that, during this period, it took place more frequently from the sloughing of arteries, than from the forcible opening of their extremities, or from the ulceration of their coats. In many of the cases in which secondary hemorrhage came on after the twentieth day, it arose from the sloughing and ulceration of arteries occasioned by hospital gangrene ; but, in by far the greater number of instances, it seemed to me to proceed from the increased determination

of blood into the capillary vessels upon the surfaces of the wounds ; and this hemorrhagic effort occurred particularly in those who had obtained, either by the mistaken kindness of their friends, or by their own intreaties, too liberal an allowance of wine and animal food.

WOUNDS OF THE HEAD.

IN detailing the effects, which we had occasion to see, resulting from wounds of the head, I shall adhere, in some measure, to the usual division which is made of these injuries, into those which affect the integuments and cranium, and those which affect the brain and its membranes. The injuries of these parts are frequently combined in the same individual case; but those of the brain and its membranes are often made known to us only by their remote effects. In a considerable proportion of those who had received wounds of the head, most of the primary symptoms had disappeared before our arrival in Belgium. These injuries had been inflicted chiefly by the sabre, and by musket-balls, and where only the soft parts covering the head had been affected, the wounds in general healed very readily. We saw very little of the crysi-

pelas which is so common an attendant upon wounds of the head. Indeed, we saw but few wounds of any kind to which erysipelas had supervened.

In some of the wounds, in which the head had been struck obliquely by the sabre, portions of the cranium had been removed, without the brain appearing to have sustained much injury. In one case of this kind, where a considerable portion of the upper part of the occipital bone along with the dura mater had been removed, a tendency to protrusion of the brain took place during an attack of inflammation; a slight degree of stupor with loss of memory occurred; but on the inflammatory state having been subdued, the brain sunk to its former level, the stupor went off, and the memory returned. It seems probable, that, when the brain protrudes in cases of this kind, a disposition to the formation of fungus may be given; but in the instances in which I have seen this tendency to protrusion occur, it has appeared to me to proceed from causes very different from those by which fungus is usually produced. We had frequent opportunities of seeing the upper, and the lateral parts of the cere-

brum exposed by sabre-wounds; but in no case, except that which I have mentioned, did any tendency to protrusion of the brain present itself to our notice. In a remarkable sabre-cut in the nape of the neck of a Frenchman in the *Corderie*, more than an inch in breadth of the inferior part of the left lobe of the cerebellum had been exposed, and was seen pulsating for a period of eight weeks, without any tendency to protrusion having taken place. This exposure was unaccompanied by any particular constitutional affection; but, like several others who had received deep cuts on the back part of the neck, this man complained of great feebleness in the lower extremities.

In the cases in which the sabre had struck the head perpendicularly, the effects which it produced were extremely diversified. In some cases, the external table of the cranium was divided, the internal remaining uninjured. In a Frenchman who had received twenty sabre-cuts in different parts of the body, and who died from the symptomatic fever appearing to arise from the high degree of inflammation attendant upon a wound of the elbow-joint, there were found on examination after death, not

fewer than thirteen cuts of the upper part of the cranium, penetrating only its external table, without any inflammation having been communicated to the brain or its membranes. In other cases, both tables were divided, and the edges of the internal turned in upon the brain and its membranes. In almost all these cases, exfoliations of a greater or smaller extent were taking place, and retarding the completion of the cure. We saw some cases of this kind, in which paralysis of the extremities had occurred from the first; and others, in which it had come on during the exfoliation of the bones of the cranium, and the suppurations which accompanied that process.

In some instances of the paralysis from sabre-wounds, as well as in those made by gun-shot, the paralysis was confined to the upper, and in others, to the lower extremity. In every instance in which it distinctly appeared that the injury existed on one side of the head, the paralysis uniformly manifested itself upon the other; but we were unable to perceive any other fixed relation between the part of the brain which had been injured, and the part of the body affected with palsy. A wound of the right parie-

tal bone by a musket-ball was followed by palsy of the left arm and leg. In another case, a wound penetrating the upper part of the right parietal bone, was accompanied by a slight paralytic affection of the left side of the mouth, and complete palsy of the left leg. In a third case, a sabre-wound of the same bone, followed by extensive exfoliations, gave rise to a complete palsy of the left side.

In cases in which musket-balls strike against the cranium, besides the injury of the brain which may be occasioned by the fracture and depression of the skull, and subsequent extravasation of fluids under it, contusion of the substance of the brain itself is generally produced, and this contusion may even occur in cases in which fracture of the cranium has not taken place. A striking example of this contusion of the brain presented itself on the examination, after death, of the head of a man who had died in consequence of a blow, which he had received from a musket-ball on the left side of the cranium. The contusion was communicated through the whole breadth of the hemisphere above the lateral ventricle, and the substance of the brain appeared in this track

as if a bullet had passed through it. For some time previous to death, a fungus had protruded through the wound in the cranium, and this fungus, which seemed to be formed by an exudation of organizable lymph, was of a much firmer consistence than the contused brain.

We had occasion to see various examples of stupor which had been immediately occasioned by the contusion of balls, and which continued after the compression from depressed portions of bone or the extravasation of fluids had been removed. In one case of recovery from stupor, loss of memory continued after the other faculties of the mind had been restored. In a wound of the posterior part of the parietal bone, accompanied at first by stupor, the memory returned, but the person was for some time unable to articulate words, so that he was obliged to make known his wishes by means of his pen.

Various instances presented themselves of remarkable changes in the state of the pulse from injuries of the head. In a case of wound of the posterior part of the skull with depression, the pulse had at one time sunk so low as thirty-six beats in the minute. The patient

recovered from this state, and seemed for a time to do well; but extensive protrusion of the brain took place: he died at the end of six weeks, and the whole hemisphere of the brain, on the side of the injury, was found converted into a soft red substance. We found irregularity of the pulse a very frequent attendant upon the state of compressed brain.

Sometimes the pupils were dilated in those who had suffered injuries of the head. In a man who had received a concussion, the pupil of the right eye was dilated, the left remaining unaltered. I remember to have seen a similar case, in which the pupil of one eye was dilated and the other contracted. Strabismus, or squinting, was by no means an unfrequent consequence of injuries of the head; but I have omitted to mark the proportion of cases in which this affection occurred.

There are two kinds of secondary inflammation which succeed to gun-shot wounds, as well as to other injuries of the head, that which is confined to the parts which have been more immediately struck, and that which is more or less extensively diffused over the surfaces of the brain and its membranes. The writings of

Le Dran and Pott contain every thing which is known with regard to the appearances and treatment of circumscribed secondary inflammation. This is an affection which often admits of relief by operation. But the case is far otherwise with the secondary inflammation which is diffused over the surfaces of the brain and its membranes; and frequent opportunities of examining the brains of those who have died of injuries of the head, have convinced me, that this diffused inflammation is much more frequent in its occurrence than the circumscribed. The writings of Dease and Schmucker contain the best description, with which I am acquainted, of the symptoms which occur during life, and of the appearances which present themselves after death, in those who have been attacked with the diffused secondary inflammation. Very few examples of this variety of inflammation occurred in Belgium; and I am convinced that this was owing to the very great pains which were taken by the military surgeons to treat those who had received injuries of the head by the strictest rules of the antiphlogistic regimen. The result, I am convinced, would have been very different, had wine, brandy,

opium, or other diffusible stimuli been administered, or the use of animal food been allowed.

In a considerable number of those who had had the cranium severely contused or fractured by musket-balls, fungus growths took place through the openings which had been made at first by the ball, or afterwards by the trepan. These growths, I am inclined to believe, are the consequence of a contusion of the substance of the brain, and of the membranes that cover it, which gives rise to the formation of a new organized substance, different in its texture from brain; and are not, as some late writers would endeavour to persuade us, simply protrusions of brain resulting from the removal of the natural resistance which is made to them by the dura mater and cranium. I have known instances of substances, similar to these growths, forming on the surface of the brain, immediately under the place where the cranium had received a contusion in cases in which the trepan had not been applied, or any portion of the cranium removed. Whether, in these cases, the removal of a portion of the cranium, by admitting of the protrusion of the fungi, might not have produced an alleviation of the symptoms

of compression which occurred before death, is a point which may admit of dispute. For my own part, I cannot conceive in what manner the removal of a portion of the cranium, in cases of that kind, could possibly have done any mischief.

Fungus of the brain, in the greater number of instances in which we had an opportunity of observing it, was accompanied either by stupor or paralysis, and by the other symptoms of compressed brain. In a fracture of the vertex of the cranium produced by a musket-ball, and followed by a fungus of the brain, the paralysis took place in the lower extremities. In a case of wound made by a musket-ball on the right side of the forehead, and in which spicula of bone had been driven in upon the brain, a large fungus protruded. The formation of this fungus was followed by slow pulse, stupor, dilated pupils, slight strabismus, and distortion of the mouth. In the progress of this case, escharotics were applied to the fungus, portions of it were torn off by the patient, and all of it that was exterior to the cranium was twice pared off by the knife, with an apparent alleviation, rather than aggravation, of the symptoms. On

the death of this patient, nearly the whole of the right hemisphere of the brain was found converted into a soft pulpy mass. The left hemisphere was not changed in structure, though much vascular turgescence appeared on its surface.

Though stupor and paralysis, among the wounded in Belgium, seemed to have depended most frequently upon the injury of the brain produced by contusion, yet these affections were sometimes immediately, and in other instances remotely, occasioned by the depression of portions of bone, or by the extravasation of fluids. We saw several instances, in which sometimes the one and sometimes the other of these states were relieved by the removal of portions of the cranium. In other instances, these affections, as has been already stated, continued after every supposed cause of compression of the brain had been removed. Various instances also presented themselves, in which, though a considerable degree of compression must have been occasioned, sometimes by the depression of both tables, and at other times by the depression of the inner table only of the skull, yet neither stupor, paralysis, nor loss of memory, were produced. In one of these cases, the middle of the right parietal bone

was fractured and considerably depressed by a ball, which was extracted on the twentieth day. In this case, neither stupor nor paralysis appeared. In another, a musket-ball had struck the right parietal bone, fractured it, and was flattened, and lodged between the tables of the skull. The inner table was much depressed, yet no bad symptoms supervened. A variety of instances served to convince us, that this separation of the tables of the skull, and the lodgement of balls between them, is by no means an unfrequent occurrence.

In a few instances, convulsions succeeded to those injuries of the head in which portions of the cranium were driven in upon the brain. This is usually to be regarded as a very dangerous symptom; but we had the pleasure to see more than one instance in which recovery took place after the depressed portions of the bone had been removed, during repeated bleedings and the use of the antiphlogistic regimen. In one case, a ball had depressed a round piece of the skull, and forced it into the substance of the brain: convulsions ensued, the patient was copiously bled, and the depressed portion of bone removed, after which the convulsions ceased.

We saw three cases in which balls had entered the cavity of the cranium, and passed on its inner surface, along the upper and lateral parts of the brain; and these cases all terminated fatally. In one of these cases, the ball entered at the lateral part of the os frontis, and passed out at the edge of the occipital bone of the same side. The patient appeared to recover till the twenty-first day, when he became affected with rigors and suppurative fever, of which he died. In one singular case, in which a ball, entering behind the right temple, and passing backwards and downwards, had fractured the bones in its passage, the ball appeared to be lodged in the surface of the brain, over the tentorium cerebelli, from which place it was extracted on the seventeenth day after the infliction of the injury. No bad symptom had manifested itself previously to the operation; and this man recovered under the strictest antiphlogistic regimen, with little or no constitutional derangement, except a slight tendency to inflammatory fever, which, upon one occasion, was induced by an incautious allowance of a small quantity of wine and animal food.

We neither saw, nor were able to procure in-

formation of any among those wounded in the battle of Waterloo, who had survived a shot which had passed through the long or short diameter of the brain.

WOUNDS OF THE FACE AND NECK.

Wounds of the Face.

THE wounds of the face were numerous, and extremely diversified in appearance. We saw various examples of sabre-wounds of this region, in which the eye-lids, nose, ears, cheeks, and lips had been divided, but in which reunion had been effected chiefly by adhesive straps, and by bandages. It appeared to me that considerable advantages might have been obtained in the treatment of several of these wounds, by a freer use of the interrupted or twisted sutures, particularly in those which penetrated into the cavity of the mouth.

Wounds in the region of the face by musket-balls, though seldom fatal, or even dangerous, are often productive of much distress, by the pain, the deformity, and the injuries to the organs of

sense which they occasion. They become dangerous in those instances chiefly in which the bullets take a direction towards the cranium or neck. Numerous examples of the perforation of every part of the face by balls presented themselves to our notice.

Besides the cases in which the musket-balls had entered the cranium through the frontal sinuses, others occurred in which the external table only that covers those sinuses had been penetrated. In some instances, the balls were divided into several portions, and in others, they were flattened, and seemed as if moulded upon the surfaces with which they had come into contact. Instances were not wanting in which bullets, after entering the sinuses, had again passed out of them without appearing to have fractured the internal table, or to have produced injury of the brain. In one instance, the ball which had entered in the middle between the sinuses, appeared to me to have passed upwards over the fore part of the frontal bone. In another case, the ball, entering nearly at the same place, passed across the left sinus, and seemed to be lodged in the cavity of the orbit, producing blindness, with great swell-

ing of the eye, and of the parts surrounding it. We saw various examples of the fistulous openings, which are well known to be one of the disagreeable consequences of wounds of the frontal sinuses.

A frequent, and most distressing species of injury, was that which had occasioned blindness by the passage of balls through or near to the eyes. In the cases where the balls had passed near to the eyes, the vision was destroyed in some, without any apparent injury of the eye-ball itself; and in others, with the occurrence of every degree of inflammation in that organ. In one case, where the ball had passed through behind the eyes, from temple to temple, one eye was destroyed by inflammation, and the other affected by amaurosis. In another case, where the ball had taken precisely the same direction, both eyes were affected with amaurosis, but without inflammation being produced. In another case, where the bullet had entered the face on the upper and left side of the nose, and passed out anterior to the right ear, the patient was affected with amaurosis of the right eye. The left eye was similarly affected in a case where the ball had entered the right side of

the nose, and had come out before the left ear. We had occasion to see from eight to ten patients in whom musket-balls had passed through behind the eyes from temple to temple : and in all of these there was great swelling, pain, and tension of the head and face. A careless examination would have led one to suppose that in these cases the balls had entered the cranium. Cases of this kind are recorded in which the blindness is supposed to have been produced by the balls passing through the inferior part of the anterior lobes of the brain ; but the results of my own observations would lead me to doubt, whether, in those cases, the substance of the brain itself had been actually injured.

In some of the patients in whom amaurosis had been produced, there was reason to believe, from the course which the balls had taken, that the optic nerves were divided. In a considerable proportion, however, of those affected with amaurosis, it was obvious that the balls had not come into contact with these nerves.

In one of the cases in which the ball had passed through below and behind the eyes, the patient was affected, at the end of some weeks, with painful spasms in the face, which, in their

severity, and in the mode of their attack, bore a striking resemblance to those of Tic Douloureux.

The number of cases was considerable, also, in which bullets had passed directly through the substance of one or both eye-balls. Various instances occurred in which the bullet in penetrating through both eye-balls, had passed behind the bridge of the nose, and left it unbroken; and others, again, in which bullets entering on one side of the root of the nose, had passed through it and one of the eyes. In one case, the ball had entered at the inner angle of the left eye, and passed out before the left ear. In another, the ball had entered above the inner angle of the right eye, and passed out of the right ear. In both cases, the eye of the side on which the ball had passed was destroyed. In a case in which the ball had entered the right eye, and had passed out midway between the left eye and ear, the left eye was affected with amaurosis.

Some very frightful-looking wounds had been made by canister or grape-shot, which had carried away the nose and fore-part of the face, and exposed the maxillary sinuses and cavities

of the nostrils. The gun-shot wounds in which the balls had entered into, or passed through, the maxillary sinuses and cavities of the nose, were accompanied with great swelling, and other marks of inflammation, of the mucous membranes which line these cavities, as well as of the integuments of the face. We saw several instances in which balls had passed across the face, through both maxillary sinuses, without vision being in the slightest degree impaired, though in general, in these cases, the vision of one or both eyes was impaired or destroyed, either by inflammation or by amaurosis. In one case, a ball had entered the left temple, destroyed the eye of that side, and appeared, from the swelling of the right cheek, to be lodged in the right maxillary sinus. In another, a ball entering at the external angle of the right eye, had destroyed it, passed through the cavities of the nostrils and left maxillary sinus, and was lodged in the fleshy part of the left cheek. In these wounds, as well as in those in which the upper and lower jaw-bones were broken, numerous fractures were produced, which gave rise to tedious and painful exfoliations.

Several instances presented themselves in

which bullets had passed through the region of the ear, and had fractured the bones of the external meatus, and mastoid processes, without appearing to have occasioned any injury to the brain. In one case, the shot which had entered behind the ear, was firmly impacted in the external meatus. In another, the ball which had entered behind the left ear, passed out of the left nostril; the hearing of the ear was destroyed, and great distortion, with paralysis of that side of the face, produced.

In a superficial wound of the face, the bullet had passed along the middle and lateral parts of the cheek, and had taken off the tip of the ear. The temporal artery was obliterated. No great hemorrhage had occurred from the wound, so that it was difficult to say whether it was a case of primary or secondary closure of this artery. In another case, in which the bullet had passed across the temple, a similar obliteration had been produced.

Musket-balls seldom enter the mouth without fracturing the jaws or the teeth. We saw several examples of cases in which the bullets had passed through the mouth; some in which they had entered that cavity, and had been spit

out at the moment of injury ; one in which the bullet was lodged in the tongue ; another in the maxillary sinus, opposite to the side on which it had entered ; and a third in which it was lodged in the fleshy substance of the cheek.

In passing through the upper part of the mouth, the balls had not only fractured the upper jaw and teeth, but they had also destroyed greater or less portions of the palate, and removed the partition which naturally divides the mouth from the cavities of the nose.

Salivary fistulæ were to be seen as occasional consequences of wounds made by the sabre, and by the passage of balls through the cheeks. When the ducts are injured which convey the saliva to the mouth, these fistulæ are very difficult to cure, if not generally incurable. We saw several cases in which the balls had passed through, and others where they had removed portions of the tongue, without the speech appearing to be much impaired.

Fractures of the lower jaw, upon one or both sides, were very common occurrences. Few of these ever heal without more or less distortion of the face being produced, in consequence of the strong action of the muscles which are in-

serted into that bone, and of the difficulty, which arises from this action, of keeping the fractured extremities in contact. This is a kind of injury in which swellings of the glands under the jaw, are liable to occur; in which tedious exfoliations of bone take place; and in which the fractured extremities occasionally show no disposition to unite by callus.

Wounds of the Neck.

WE saw no wounds in which more remarkable escapes seemed to have been made than in those which were inflicted on the region of the neck. In many instances, the bullets had passed, as was obvious from their entrance and exit, quite close to the larger blood-vessels; but in none of the cases which we saw, had the carotid artery, or internal jugular vein, been opened; the cases in which the division of these vessels had been produced, having, most probably, proved immediately fatal. In a considerable proportion of the wounds of the neck, the balls had entered by the side of the face, passed within or through the body of the lower jaw, and had come out on the side of the neck. We saw numerous examples of wounds in which the balls had taken this direction, and in which they had

come out at almost every point of the side of the neck, from the base of the lower jaw, to the middle and upper part of the back. I can have little doubt, that, in passing through this region, as well as in the cases, of which we saw several, where they had entered near to the angle of the jaw, the balls must, in many instances, have divided or injured some of the primary branches of the external carotid artery. In their first stage, no very alarming hemorrhage, so far as we could learn, had been observed in these wounds; and in three of them only, had secondary hemorrhage occurred. In one of these cases, in which the ball had passed through the mouth, the hemorrhage was suppressed by compresses applied to the external and internal orifices of the wound. In the other two instances, it was deemed necessary to lay bare and tie the trunk of the carotid artery. In one of these the ball had passed through the pharynx and wounded the trachea: the hemorrhage was completely restrained, but the man died four days after the operation, apparently from matter gradually passing through the wound of the trachea into the bronchi, and ultimately producing suffocation. The other we had frequent opportunities of seeing, during, and after his recovery.

No very unequivocal case of wound of the

œsophagus presented itself to our notice ; but we saw several wounds of the neck in which it appeared to us that the balls had passed from one side to the other, through the upper part of the pharynx. In two of these, the balls which had entered on the fore part of the left ear, had passed across the face, and come out, one a considerable way below, and the other behind the right mastoid process. In a third case, the ball had entered the right cheek, passed across the face, and was cut out at the lower part of the left side of the neck : considerable difficulty of deglutition existed in this case for several weeks after receiving the injury. In a fourth, and very singular case, the ball entered the left ear, passed across the fore part of the neck, and was lodged under the skin, at the lower part of the right side of that region.

Two cases were mentioned to us in which the lower jaw had been shot away by cannon-balls. In one of these cases, the patient died of secondary hemorrhage ; and, in the other, of an extension of the mortification which succeeded to the infliction of the wound. In a Frenchman whom we saw at Antwerp, the soft parts under the base of the lower jaw had been car-

ried away by a piece of grape-shot, and a frightful opening made through the upper and fore part of the neck into the mouth. The discharge of saliva from this opening was copious, and most distressing to the patient. This man was fed by a funnel, the end of which was introduced into the back part of his mouth. He had an extremely keen appetite, and, notwithstanding the liberal allowance of food which was given, he had become, by the end of the eighth week, very lean and emaciated, from the loss of saliva.

We saw several wounds of the larynx which had been made by musket-balls. In these the voice was much impaired, and very hoarse; exfoliations of cartilage were taking place, and the patients seemed to be passing into a state resembling consumption. A gun-shot wound of the larynx, even when unaccompanied from the first by much danger from hemorrhage or inflammation, is in its future consequences to be regarded as a dangerous accident. In one of the wounds of the larynx, the ball had entered on the right side of the thyroid cartilage, and come out on the opposite side, about two inches distant from the point where it had entered, and about

an inch lower in the neck. This man affirmed that his drink came for a day by the inferior wound, though it seems difficult to conceive how this was possible. He was affected with great hoarseness, and with a troublesome cough. In another case, in which the ball had passed directly across the upper part of the thyroid cartilage, and in which the openings were little more than an inch distant from one another, great hemorrhage took place at first, and afterwards hoarseness, cough, and a general marasmus. In a case where the ball had entered near to the ear, great hoarseness was produced, with much pain of the neck, and difficulty of deglutition. There was every reason to believe, that the ball was lodged somewhere in the upper region of the neck, on the side opposite to that at which it had entered, though its situation could not be detected. In a case of slight wound by a lance toward the lower part of the trachea, a degree of emphysematous swelling was observed for some time after the external wound had been healed.

Various instances of face and neck wounds occurred, in which, in consequence of the division of some of the cervical nerves, a greater

or less degree of paralysis of the shoulder, arm, fore-arm, and fingers, was induced. In some of these, the paralysis took place at the moment of the injury, and, in others, only after some days. In a few individuals, the paralysis was without much pain ; but, in general, it was accompanied with severe pains, not only in the part which had been more immediately injured, but also in parts remote from this, though, perhaps, connected with it by nervous communications. In one of the cases to which I allude, a ball had entered upon the left side of the neck, and passed across it to the back part of the right shoulder. This man was sensible, at the moment of receiving the injury, of his arm falling down motionless by his side : he suffered only a slight degree of pain from the wound : and after several weeks, had acquired no power over any part of the arm. In another case, where the ball had entered the lower and fore part of the neck, without passing out or producing any marks by which its situation could be guessed at, a complete paralysis of the arm was immediately produced, on the side on which the wound was inflicted. In this case also, after a lapse of several weeks, no tenden-

cy to the recovery of the power of motion in the arm had manifested itself. In other instances, balls seem to have passed through the region of the cervical nerves, without these nerves appearing to have sustained the slightest injury. In one case, a ball had entered on the right side of the thyroid cartilage, and passed out at the upper and internal angle of the scapula of the same side: paralysis was not induced, but the patient had at first great hemorrhage from the wound, together with a spitting of blood, which lasted for some days. In another case, a ball had entered about an inch and a half above the upper extremity of the sternum, and had passed out above the upper and inner angle of the left scapula: paralysis was not produced; but the patient had for some days great difficulty in breathing, and pain in swallowing. One of the more singular cases in which a partial paralysis of the arm had been immediately occasioned, was a wound of the neck by a musket-ball, which had entered over the left side of the trachea, about an inch and a half above the inner extremity of the clavicle, and had passed from before backwards, and seemed to be lodged under the scapula. The

loss of power over the arm was followed in about twenty-four hours after receiving the injury, by loss of voice, frequent attacks of vomiting, and violent and painful spasms of the diaphragm ; indicating, I conceive, the communication of inflammation from the canal of the wound to the more important nerves situate in the region of the neck. In seeing this patient since my return to Edinburgh, I have had the pleasure to observe, that the more distressing symptoms were much abated, and that he had made a considerable progress towards recovery.

We did not perceive any case of paralysis from the deep sabre-wounds which had been inflicted on the back and lateral parts of the neck, though some of them were so deep as to allow the pulsations of the vertebral arteries to be seen. In most of these wounds there was much feebleness of the extremities, particularly of the lower. We saw one example, however, of a lance-wound in the lower and back part of the neck, which was followed, some days after the injury had been received, by paralysis of the left lower extremity. We saw also a case in which a ball, having entered at the left side on the lower and back part of the neck, and ha-

ving passed out at its root on the right side, had produced paralysis of the right arm, together with slight paralysis of the right lower extremity. The paralysis of the lower extremity, in this case, had begun to diminish before we left Belgium.

WOUNDS OF THE CHEST.

THE number of those whom we saw recovering from wounds of the chest was indeed very considerable. Some of these wounds had been inflicted by the lance or bayonet; but by far the greater part of them had been made by musket-balls. The cases in which the heart and larger blood-vessels had been injured, must have proved instantly fatal, as we heard of none in which injuries of these parts had been observed.

It is often difficult to say in wounds of the chest, whether they penetrate into the sacs of the pleura; but all doubts with regard to this point are removed the moment we observe air coming out of the wound upon coughing. That the lungs have been wounded may be inferred with nearly equal certainty, in every case in which a person spits blood immediately or soon after receiving a wound of the chest.

We saw several instances of wounds of the chest, in which the wounds were confined to the parietes of that cavity, and others in which, though the wounds existed in the parietes only, the consequences resulting from them were communicated to the internal parts. Bullets are often made to change their course, and are sometimes prevented from entering the cavity of the chest, by striking obliquely against the ribs or sternum. A man in kneeling received a shot by a musket-ball, which entered at the upper and middle part of the sternum, run along the surface of this bone, and continuing its course downwards, passed along in the parietes of the abdomen into the right side of the scrotum, from which it was afterwards cut out. The long track of wound made by this ball healed readily, without either the formation of abscess, or the communication of inflammation to the internal parts. In a long wound of the parietes, which extended across the lower and fore part of the chest from one side to the other, an abscess formed in the middle of the course of the ball. This, though by no means a very frequent occurrence, is liable to happen even in cases in which neither the wadding nor portions

of the clothes are driven into, or left in the canal of a gun-shot wound.

We saw more instances than one, in which a ball in passing across a portion of the parietes of the thorax, without penetrating that cavity, had excited an alarming and dangerous degree of inflammation of the pleura. In one of these, the ball had taken an oblique direction along the lower part of one of the sides of the chest. In another, it had struck against a strong leathern belt that was suspended over the right shoulder, made a deep indentation in this belt without penetrating it, and produced a severely contused wound at the inner extremities of the first and second ribs of the right side. This patient suffered much from inflammation. The injured portions of the ribs had exfoliated and come out, and the motion of the lungs in inspiration and expiration was perceptible from the sinking and rising of that part of the parietes which had been deprived of its bony support. In another remarkable case, the ball entered above the middle of the clavicle, and passed out at a point directly behind. Neither at the first, nor at the time we saw this case, was there any reason to believe that the ball had wound-

ed the pleura. Inflammation, however, of this membrane came on, which terminated in supuration. The operation for empyema was performed, and about four pints of pus evacuated.

We did not see, nor were we informed of any cases in which the internal mammary or intercostal arteries had been divided, either by the pike or by musket-balls. In a gun-shot wound, however, of the right side, secondary hemorrhage had taken place from one of the intercostal arteries on the fifteenth day, which was suppressed by introducing a compress into the wound, so as to press upon the open extremity of the artery.

Hemorrhage, by the mouth, threatening suffocation, is well known to be one of the most alarming symptoms which occur in wounds that have penetrated into the substance of the lungs. This hemorrhage had, so far as we could learn, been more severe in wounds inflicted by the lance, than in those made by musket-balls; though the lance-wounds seemed in general to heal afterwards more readily than those made by gun-shot. In a few, this hemorrhage ceased entirely during the first day after receiving the wound; but, in a far greater number of cases,

it continued for a period of nearly eight days. In passing this period, it usually ceased about the end of the second week. We met with only one instance in which, after this period, the spitting of blood had continued.

The hemorrhage from the external wounds had in some instances, particularly in those inflicted with the lance, been very copious; but this had always been easily suppressed by shutting up the external orifices of the wounds with compresses and a proper bandage. In no instance in which this practice was employed, had it been followed, so far as we could learn, with any injurious effects, or with the necessity of re-opening the wound for the evacuation of blood. One case only occurred to our notice, in which there seemed to be any reason to suspect an accumulation of blood in the sac of the pleura. This was in a lance-wound of the right side of the chest, from which a copious hemorrhage took place, that was suppressed by the application of compresses and a bandage; a sense of weight was felt over this side, with difficulty of lying upon the left side. There was no symptom, however, so urgent, as to seem to require an opening to be made into

the chest. What quantity of blood can be extravasated into the sac of the pleura, after the external wounds are closed, what quantity may be absorbed from that sac, what are the best diagnostic symptoms of the extravasation of blood, and by what means it may most safely and easily be evacuated, are all points concerning which we stand much in need of information. Neither in this, nor in any other case of injury of the chest which came under our observation, did that discolouration of the loins from the infiltration of blood appear, which has been described by Valentin, as characteristic of extravasation of blood into the sac of the pleura. M. Larrey is among the few practical authors who have had an opportunity of confirming Valentin's observations.

In almost all the injuries of the chest attended at first with hemorrhage, the lancet had been freely used by the English surgeons, which had tended not only to suppress the hemorrhage by the mouth, and by the wounds, but also to prevent much of the danger which must have otherwise arisen from high degrees of pleuritic and pulmonic inflammation. In a case in which a musket-ball had entered the left shoul-

der a little behind its middle and upper part, and in passing through the lungs, had come out below the left nipple, a profuse hemorrhage of arterial blood had taken place by the mouth, which threatened immediate suffocation. The hemorrhage was repressed by repeated bleedings, which were resorted to on every fresh attack of the hemorrhage, and pushed till relief was obtained. Leeches were applied to the side in great numbers, and the antiphlogistic plan of treatment was strictly pursued. Two hundred and fifty ounces of blood were in this case drawn off by the lancet in eighteen days, by which the strength of the patient had been much reduced, though, at the time we saw him, he seemed to be in a fair way of recovery.

Three cases presented themselves to our notice, in which balls that had entered the chest appeared to be lodged in that cavity. Though the symptoms had in all of these cases been severe, yet the patients seemed to be passing into a state of convalescence. In one case, a considerable quantity of pus and air came out through the wound upon coughing. In a second, great difficulty of breathing had at one time occurred; but this yielded to blood-let-

ting, and the strict use of the antiphlogistic regimen. In the third, the ball had entered about three inches below the inferior and inner angle of the left scapula; the wound, through which blood, air, and pus had been discharged, was healed; but the dull sound which was emitted on striking the left side of the thorax, and a considerable difficulty which existed in breathing, seemed to indicate, that some effusion had taken place into the left side of the pleura; contrary, however, to the usual observation in such cases, this patient affirmed that he breathed most easily when lying on his right side.

Two cases occurred in which balls having passed through the chest from before backwards, appeared to be lodged under the scapula. In one of these, a considerable elevation of that bone, with an inflammatory and œdematous swelling of the integuments over its lower part, were produced. In the other, the inflammatory symptoms having subsided, the elevation was less considerable; but the patient felt, in the movements of the arm, as if a round body rolled under the scapula.

We saw ten cases, in which the balls enter-

ing on the fore part of the neck and chest, and passing through this cavity, had come out through the scapula. Most of these wounds seemed to heal very readily; but, in some of them, exfoliations of portions of the scapula were taking place; and in others suppurations forming, which might require to be let out by openings made below that bone.

Three cases occurred also, in which the balls having entered the chest through the left scapula, one of them had come out near to the left papilla, the second close to the upper part of the sternum, and the third, in passing across to the right side of the chest, had come out anterior to the outer edge of the right scapula: this patient spat blood for fifteen days, but had at no time experienced any very great difficulty in breathing.

Besides the last-mentioned case, other two cases occurred in which the ball had passed through both sides of the chest. In one of these, the ball had entered on the lower part of the left side of the sternum, passed across under that bone, and had come out about four inches below the right axilla. In the other, the ball had entered about four inches below the

left papilla, and passed out at the same distance below, and to the outer side of the right papilla. Pus flowed readily out of the left side of the chest upon coughing.

Of emphysema, very few cases presented themselves. In a wound made by a lance, which had entered the chest at the lower part of the left scapula, a large circumscribed and puffy tumour had formed, attended with apparent enlargement of that side of the chest, and extreme difficulty in breathing. On a free incision being made into this tumour, the air, which had been accumulated in great quantity in the sac of the pleura, was permitted to escape, together with a considerable quantity of bloody serum. The discharge of these fluids was followed by great, and almost instantaneous, relief to this patient.

If the inflammation, which is at first the consequence of wounds, or of other injuries of the chest, be not subdued, or if, after having been subdued, it should recur as a secondary affection, suppurations of the pleura are liable to form, and death often happens from the supervention of hectic fever. In the cases of this kind, which came under our notice, the suppurations

were going on, some with open, and others with closed wounds; of the open wounds, some had narrow orifices, and were seated high in the chest, so that the matter of suppuration was discharged with extreme difficulty. This is a state of wounds of the chest in which great advantage may, I conceive, be occasionally obtained by making a counter-opening on the lower and lateral parts of the chest. Whether in the management of the more depending openings, the use of tents and tubes is not sometimes necessary and proper, is a point, which I think deserving of more attention than it appears hitherto to have received from military surgeons. What the cases of wounds of the chest therefore are, in which tents and tubes may be useful, or in which they are likely to prove injurious, I should beg leave to suggest as an additional and interesting question for the subject of a prize essay.

I was present at the opening of only two of the bodies of those who had died of empyema, arising from the secondary inflammation supervening to wounds of the chest. In one of these, the lung of the wounded side was completely collapsed and agglutinated to the me-

diastinum; the surface of the lung, as well as that of the pleura costalis, was covered with a whitish purulent lymph. In the other, appearances in every respect similar had taken place, except that the wounded and collapsed lung was drawn across the chest, and attached by adhesion to one of the inner edges of the orifice of the wound in the parietes.

We saw several cases in which the external wounds having healed during the continuance of pleuritic inflammation, pus was secreted, so as to occasion the formation of empyema. These cases were in general characterized by occasional attacks of rigor, by great difficulty of breathing, particularly in lying on the side opposite to that on which the injury existed, by flushed cheeks, and, in the extreme state, by purple lips, enlargement of the side on which the accumulation had taken place, and the emission of a dull sound upon the percussion of that side. The operation for the evacuation of the matter from the chest, was performed with great and sensible relief in several cases, both at Brussels and at Antwerp. We saw one man, a Frenchman, die of empyema in great agony, who obstinately resisted every proposal made

to relieve him by operation. Whether in the progress of the healing of the wounds made by the surgeon in the lower and lateral parts of the chest for the evacuation of pus, these wounds should be left to themselves, or have their edges kept from adhering by the introduction of short tents or tubes, or whether an attempt may even be safely made, and at what period, to close these wounds, are points which are all extremely deserving of the investigation of the military surgeon. I am not aware, that much accurate information is to be found respecting them in the records of surgery.

One case only occurred to our notice, in which a protrusion of a portion of the lungs took place through a wound in the chest. In this case, though the communication of the external air with the cavity of the chest had been cut off by the adhesion of the protruding portion to the inner edge of the orifice in the parietes, yet the patient suffered much from repeated attacks of inflammation.

Wounds of the Diaphragm.

WOUNDS of the thorax are not unfrequently complicated with wounds of the abdomen. In various instances of this kind, there existed undoubted proofs of the fact, that wounds of the diaphragm are not necessarily fatal; for it must have been perforated once, if not twice, in several of the cases we saw, in which balls had passed across the lower part of the chest, and the same thing must have happened also, I conceive, in most of the cases in which the liver had been wounded. In one case, the ball had entered the right hypochondriac region under the edge of the false ribs, and come out on the right side of the spine, on a level with the superior edge of the os ilium. This patient spat blood for some days, and voided it also by stool. On the examination after death of a patient who died thirty days after receiving the wound, and in whom a ball had entered the chest on the lower and outer part of the right papilla, and had come out of the abdomen on the left side of the umbilicus, the right lobe of the lung was found wounded, and the diaphragm, and

the upper part of the right lobe of the liver, perforated. But neither in these cases, nor in several others of the wounds of the diaphragm which we saw, did any peculiar symptoms, such as the risus sardonicus, or convulsive motions of the chest, present themselves to our notice.

WOUNDS OF THE ABDOMEN.

Wounds of the Parietes of the Abdomen.

WE saw no patient in whom the parietes of the abdomen had been severely contused or wounded by a cannon-ball, but we were informed of different instances of men wounded in this manner, who had lived for several days. We saw several examples of the great difficulty which exists in particular cases, of determining whether a ball has or has not entered the cavity of the abdomen. This difficulty may arise from the ball taking a circuitous route in the parietes of the abdomen, or from its passing through that cavity, but without injuring materially any of the viscera which it contains.

We saw many instances of wounds of the parietes of the abdomen. In one of these, the

ball had entered the upper part of the right thigh, a little behind the anterior and superior spinous process of the ilium ; and in passing across the fore part of the abdomen, had come out nearly about the same relative spot on the left side, as that at which it had entered on the right. In the same hospital, and lying near to this patient, we saw a case in every respect similar to this, except that the ball, which had passed as nearly as it was possible to imagine through the same parts, had entered on the left, instead of the right side. In a third case, a ball had entered at the navel, and had come out at the middle and posterior part of the right side, but without entering the cavity of the abdomen, or injuring any of the parts contained in it. A man was struck by the splinter of a shell on the right buttock, a little below and behind the spinous process of the ilium. A hardness and swelling in this case took place over the right hypochondrium, and right side of the epigastric region. The tumefaction subsiding, a large body was felt between the extremities of the right false ribs and the navel. This body was cut down upon, and a piece of shell, weighing nine ounces and a half, was extracted on the twenty-fifth day after

the wound had been received. This body seemed to have occasioned only a very slight degree of peritoneal inflammation. In a case in which it was doubtful whether the ball had penetrated or not, it had entered at the anterior extremity of the cartilages of the false ribs of the left side, but had not passed out. After some weeks, a tumour formed upon the left side of the back, from which the ball was cut out. This patient had great pain in the epigastric region, with vomiting of food for some days after receiving the injury. In another case, a ball seemed to have passed through the right hypochondrium, but no bilious discharge took place from the wound, so that it was doubtful whether the liver had been wounded. And in another case, the ball had entered the parietes of the abdomen above the pubis, and had passed out anterior to the trochanter major. The patient complained of severe pain through the whole of the limb; but it was doubtful whether the ball had entered the cavity of the abdomen. The principal danger in wounds of the parietes of the abdomen seems to arise from the communication of inflammation from these wounds to the peritoneum, and hence the propriety of adhering strictly, for

some weeks, in every wound of this kind, to the use of the means by which inflammation may be best prevented or subdued.

Wounds of the Liver.

WE saw twelve cases of wounds of the liver, in which considerable progress towards recovery had been made before our return from Belgium. Most of these wounds had two orifices; in some instances, one of the orifices was in the parietes of the chest, and the other in those of the abdomen; in other instances, the orifices appeared to be both in the chest, or both in the abdomen. We saw but two cases in which a single opening existed. In one of these, there was a considerable discharge through the wound, of a serous fluid tinged with bile, and the patient said that he had for some time spat bile on coughing. In the other, the ball had entered through the anterior extremity of the eighth rib on the right side, and was supposed to be lodged in the spleen, from the pain that was felt in that region; but of this there could be no certainty. In this case, bile, near-

ly pure, was discharged from the wound for many days ; but when we last saw this patient, about eight weeks after he had received the wound, the bilious discharge had ceased. In consequence of the inflammatory symptoms which supervened in this case, it became necessary to take away above one hundred and twenty ounces of blood during the first ten days, by which these symptoms were subdued. On the fifteenth day, a hemorrhage from the wound took place, by which the patient lost about twenty ounces of blood. This hemorrhage recurred to the same extent on the thirty-first day, with a slight accession of inflammatory symptoms, which were removed by two additional and copious bleedings. In the treatment of the case, it was found necessary to have frequent recourse to purgatives, their omission being always attended with febrile symptoms and great general distress.

We had no opportunity to see, nor were we informed of any cases, in which the bile, either from the liver or gall-bladder, had, in wounds of these parts, been effused into the cavity of the abdomen. In one singular case of wound of the liver, of which the patient died on the

thirtieth day, it was found, upon examination after death, that the ball which had entered the chest at the lower and outer part of the right papilla, had passed through the lower part of the lungs, and the upper part of the right lobe of the liver, and that entering the abdomen, it had come out of that cavity on the left side of the umbilicus. The injured lung had collapsed, and was covered with an exudation of coagulable lymph. Between the wound on the convex surface of the liver and the peritoneum, passing from the inferior surface of the diaphragm to the parietes of the abdomen, a considerable quantity of bile was accumulated in a cavity which resembled an abscess. This bile was prevented from falling into the cavity of the abdomen by the newly formed adhesions with which it was every where surrounded.

Several other instances presented themselves in which the wound of the liver was combined with one of the lungs, and in which bile was discharged through the wound of the thorax. A case has been already mentioned, in which the ball was lodged, and in which bile was expectorated on coughing. In another case, the ball entered below the scapula, on the right

side, and was cut out of the anterior part of the right hypochondrium ; a copious glutinous discharge, tinged with bile, made its escape at the posterior orifice. In another case, a ball had entered about an inch and a half below the last rib on the right side ; a bilious discharge ensued, and afterwards empyema supervened. And in another case, the ball had entered at the lower part of the left side of the sternum, and was cut out at the middle and outer part of the right side. This patient spat blood for two or three days, and had a bilious discharge through the anterior wound, which gradually disappeared. In some instances, the bilious discharge from wounds of the liver was extremely glutinous ; in other instances, it had the consistence sometimes of pus, and sometimes of serum ; and, in others again, it was mixed with considerable quantities of coagulated blood.

None of the cases of wounds of the liver which we saw were accompanied by jaundice, though in several of them a considerable sallowness of the skin existed. We were informed, however, of two cases, one of which had terminated fatally on the eleventh, and the other on the fifteenth day, in which the skin

had become, before death, as yellow as it usually is in jaundice. I suspect that, in both instances, the yellowness was of that kind which we saw occurring in the symptomatic fever attendant upon wounds of other parts, when it assumed the form of synochus putridus. A third case of which I was informed, terminated fatally on the twentieth day. In this case, the ball was found lodged in the substance of the liver; but no unusual yellowness of the skin had appeared before death.

We saw no case of wound of the spleen, unless we were to regard as such the wound I have already mentioned, in which a ball was supposed to be lodged in that organ. We were informed, however, of two cases of gun-shot wounds of the spleen, both of which had terminated fatally; the one from hemorrhage through the external wound, and the other from the effusion of blood which had taken place into the cavity of the abdomen.

Wounds of the Stomach and Intestines.

WE saw only two patients recovering from

wounds of the stomach. One of these wounds had been made by a lance, the other by a musket-ball. In both, the contents of the stomach had come out, for some days after receiving the injury, through the wounds, which were situate in the epigastric region.

Among twelve cases recovering from wounds of the intestines, we saw no example of the protrusion of these viscera. In a case, however, of a lance-wound above the pubis, a protrusion of a small portion of omentum had taken place, but without producing any bad symptoms.

In most of the cases of wounds of the intestines, the balls had passed through and out of the abdomen. In two cases, however, they appeared to be lodged in that cavity. In one of these, the ball had entered the upper part of the left groin; the fæces passed for seven days through the opening which it had made in the parietes of the abdomen, after which, they continued to be discharged by the natural passage. In the other case, the ball had entered the cavity of the abdomen immediately above the root of the penis, and produced a wound there through which the fæces continued to be discharged in considerable quantities. In two in-

stances, also, in which there was an entrance, but no external exit, the balls had been voided by the anus. In one of these, the ball had entered the left groin, a little lower than the superior spinous process of the ilium, and passed downwards and backwards into the rectum, from which it was discharged. In the other, the ball had entered on the right side of the umbilicus, about two inches distant from that place, and was voided by the third stool which the patient had after receiving the wound. This patient was bled copiously, and had no uneasy sensations.

In some of the cases of intestinal wounds, the fæces had come out from the first day by one, and in others by both of the orifices. In one case, a ball had entered the left groin, and passed out of the right buttock; the fæces had been for some time discharged by both orifices; but when we last saw this patient, they came only from the wound in the groin during the action of a purgative. In one case, the fæces first appeared in the wound three days after it had been received; but they afterwards continued to be passed in great quantities by both of the orifices. In another case, in which a ball had

entered above the spine of the os ilium, and had passed out near to the umbilicus, the fæces came out of the anterior orifice, only when the patient coughed,—a circumstance which occurs not unfrequently in the healing of wounds of the intestines.

Wounds of the smaller intestines are in general either primarily or secondarily fatal, while those of the larger intestines often heal without difficulty. We saw but two distinct examples of wounds of the smaller intestines in a state of recovery. In one of them, the ball had entered a little to the inside of the right anterior and superior spinous process of the ilium, and had passed out a little below and to the left side of the umbilicus. A quantity of yellowish bilious-looking fæces was discharged for several weeks by both orifices, particularly from that in the middle of the abdomen ; but before our leaving Belgium, the discharge had ceased, and the man, though much emaciated, seemed to be in a fair way of recovery. We saw another patient also considerably advanced in recovery, who had received a wound by a ball which had entered about three inches above the posterior spinous process of the ilium, on the left side,

and had passed out of the right hypochondriac region, near to its middle. A part of the food which he took was said to have come for fifteen days by the posterior orifice, through which two lumbrici were also discharged. This man never had any vomiting.

Few points in surgery have of late years been better elucidated than the treatment of intestines which have been opened by wound, or by sphacelus succeeding to strangulation. That in these cases, the more that is left to Nature in the process of reunion, and the less that her operations are interfered with, the greater will be the chance of ultimate recovery, is a conclusion to which we have been led by a very full induction of experiments, facts, and reasonings, to be found in the writings of various authors; but in none more clearly or ably stated than in those of Scarpa and of Mr Travers. It cannot, however, be too frequently repeated, that copious blood-letting, and the use of the antiphlogistic regimen, in all its parts, are the best auxiliaries which the surgeon can employ in the cure of all injuries of the viscera contained within the cavity of the abdomen.

In a very singular case, in which a musket-

ball had entered the abdomen a little way below, and to the left side of the umbilicus, and had come out on the same side, near to the spinous process of one of the lumbar vertebræ, a small quantity of fæces continued, during our stay in Belgium, to be discharged by the posterior wound, through the whole depth of the muscles of the loins. This man was sensible of voiding quantities of air along with his urine; and, in the progress of his case, not only small quantities of air, but also of his urine, were distinctly observed to be mixed with the fæces which escaped from the wound. In this case, it seems probable that an opening existed in the ureter of the side on which the wound had been inflicted. In another wound in the back, in the region of the kidney, urine was discharged by the orifice of the wound, for twenty-five days. During this time, the quantity of urine voided by the urethra was considerably diminished, and the patient had suffered, and continued to complain of great pain in the course of the spermatic cord.

Wounds of the Bladder.

WE saw no fewer than fourteen cases recovering in which the bladder had been penetrated by musket-balls. In most of these cases, the balls had passed through and out of the pelvis; and it generally happened that the entrance and exit of the ball was situate on opposite sides of the pelvis. In one case, however, a ball, in passing across the abdomen, about two inches above the pubis, had removed a small portion of the parietes of that cavity, and wounded the bladder. Urine was discharged from this wound for nearly five weeks. In three of the cases of bladder-wounds the balls were lodged. In one of these it had entered on the upper and right side of the symphysis pubis; blood came immediately after the injury from the urethra; but the urine did not begin to be discharged from the wound before the third day. In the second case, the ball had entered the left groin, from the wound in which the urine continued to be discharged at the time we left Belgium. In the third case, the ball had entered the buttock; the urine came out by the wound, but at

the time we last saw this patient, rather in smaller quantity than at first.

Two of the wounds of the bladder which we saw were complicated with wounds of the intestines. In one of these, the ball had entered the tip of the right buttock, and come out of the middle of the left groin. The urine in this patient was discharged partly by the wound in the groin, and partly by the rectum: he had a healthy appearance, and seemed to experience very little uneasiness from the injury; indeed, so little, that he was extremely indignant at its being proposed to him to wear a flexible catheter in his urethra. In the other, the ball had entered about the middle of the right groin, and passed out of the tip of the buttock of the same side. A portion of the urine, and some fæces, were discharged for eight days through the anterior opening; and, for the same length of time also, a portion of urine had passed through the posterior opening.

In some of the cases of wounds of the bladder, the urine came only by one orifice. We saw an example of this in a case in which a ball had entered about two inches above the pubis, on the left side, and passed out of the right but-

tock. In this case, the urine came by the anterior opening only ; but in most cases of wounds of the bladder, the urine came by both orifices.

In the wounds of the bladder, the continued use of the flexible catheter, by affording a ready passage for the urine along the canal of the urethra, was of great service to such patients as could be prevailed upon to wear it. In a case in which the ball had entered on the left and upper side of the pubis, and passed out of the inner side of the right buttock, the urine at first came through both wounds. The external orifice of the anterior wound healed, and the use of the catheter being neglected, an abscess formed, from an infiltration of urine into the upper and inner part of the thigh. This abscess was opened by the knife, and the urine continued to be discharged by the puncture.

There can be little doubt, that, in none of the cases of wounds of the bladder which we saw, had the urine found its way into the cavity of the abdomen.

Several cases of wound in the region of the pelvis occurred, in which it appeared to us that balls had passed through that cavity, without injuring either the bladder or intestines. In one

case at Brussels, the ball had entered on the right side of the symphysis pubis, and had passed out of the middle of the right buttock. This patient complained much of pain, and had a considerable degree of fever; but there had been neither fæcal nor urinous discharge. In another case which we saw at Antwerp, the ball had taken, as nearly as possible, the same direction; and having neither wounded the intestines nor bladder, seemed to have produced very little constitutional or local injury.

Wounds of the Penis and Testes.

WE saw several wounds of the penis made by musket-balls. In one of these, a ball had passed over the upper and back part of the glans, and had removed a portion of it; in another, the ball had passed from side to side, through the middle of the body of the penis. Both of these wounds had healed in a very kindly manner, and were nearly cicatrized. We saw one case at Brussels, and another at Antwerp, in which a ball had carried away a considerable portion of the inferior surface of the urethra,

with a portion, in one of these cases, of the anterior part of the scrotum. In both instances, catheters were introduced, by which the urine was discharged, and the granulations forming on the edges of the wounds, very properly drawn together by means of adhesive straps placed over these catheters.

We saw several cases also in which balls had passed through one or both testes. In one case, in which a ball had removed a portion of the scrotum, the right testis protruded at first through the opening, but it was afterwards replaced by an operation. In another case, the left testis having been exposed in a similar manner, became of so large a size, that it was deemed necessary to remove it. We saw one young man affected with violent hysterical paroxysms, in whom a musket-ball, having passed through both testes, had occasioned great swelling and pain of these organs. A very common wound was that in which a musket-ball, entering by the scrotum on the left side, had passed through it and the posterior part of the right buttock.

WOUNDS OF THE LOINS AND PELVIS.

A VARIETY of cases occurred in which balls had passed across the region of the loins in almost every direction. Some of these wounds healed very readily; in others, abscesses had formed in their canals, and the matter formed by suppuration had, in some instances, passed under muscles and fasciæ to a considerable distance from the original wounds. It became, therefore, occasionally necessary to make openings into these abscesses, in order to evacuate the matter, and by this to prevent the formation of sinuses. In one of these cases, a ball had passed through the posterior part of the left arm, immediately below the insertion of the deltoid muscle, entered the back over the inferior edge of the left scapula, and had come out at the middle and upper part of the crest of the right os ilium. In a second, the ball had entered

the loins upon the right side about four inches above the middle of the crest of the right os ilium, and had come out under the inferior angle of the left scapula. In a third, the ball had entered over the middle of the crest of the left os ilium, passed across the loins, and come out a little way above the crest of the os ilium on the right side. In a fourth case, the ball had entered the integuments of the abdomen, immediately over the short ribs of the right side, and passed out at the upper part of the right buttock, near to its junction with the left. In a fifth, the ball, entering near to the middle of the left buttock, had passed out over the middle of the crest of the right os ilium.

Many cases presented themselves to our notice, in which the balls had obviously passed over a greater or less portion of the pelvis; and others, in which it was difficult for us to determine, even from the exfoliations of bone which were taking place, whether the balls had penetrated into, or had passed through, that cavity. In one case, the ball had entered at the outer and lower part of the left buttock, and had come out of the integuments of the abdomen, about two inches above the anterior superior

spinous process of the ilium of the same side. In another, the ball had entered over the middle of the crest of the right os ilium, passed obliquely downwards, and was cut out at the verge of the anus on the right side. And in a third instance, the ball had entered on the left side of the spine about the middle of the lumbar vertebræ, and passed out a little behind and below the trochanter major of the right thigh.

In several instances, the balls appeared to have passed under the pelvis, though in some of these the entrance and exit of the balls had the same relative positions, as in the cases in which balls had passed through that cavity. In one of these, the ball had entered the upper part of the scrotum on the right side, and had passed out of the same side at the anterior verge of the anus. In other three cases, the balls, entering nearly at the same place as in the last, had passed out over the middle of the right buttock. In a fifth example, the direction of the ball was reversed, as it had entered at the right buttock, and passed out through the scrotum. In a sixth, the ball had entered above the root of the penis, and had come out

of the right buttock, without appearing to have passed through the pelvis. In a seventh, the bullet had entered the upper part of the left side of the scrotum, and had come out of the upper and inner part of the buttock of the same side. In an eighth case, the ball had entered the tip of the left hip, and had passed out of the right side of the penis. In none of these cases, was paralysis produced, nor did any mark appear of injury of the parts contained within the pelvis.

It is difficult to conceive how balls should have taken the directions which I have noted in the following cases, without injuring the nerves, blood-vessels, or other important parts which are contained in the pelvis; and yet in none of these cases did any appearances present themselves at all different from those which occur in simple gun-shot wounds. In one case, the ball had entered the right buttock immediately behind the trochanter major, and was found lodged under the integuments in the middle of the left groin, from which it was afterwards extracted. In two instances, the balls had entered on the inside of the anterior superior spinous process of the os ilium on the right

side, and passed out of the right buttock, a little above and behind the trochanter major. In a fourth case, a ball had entered the inner part of the right groin, and had passed out of the middle of the right buttock. In a fifth, a ball had entered on the upper and right side of the symphysis pubis, and had passed out of the tip of the right buttock. In a sixth, the ball had entered the left groin, immediately over the anterior obturator nerve, and had passed out of the middle of the right buttock. In a seventh case, the ball had entered the tip of the left buttock, and had passed out at the root of the penis on the right side. In an eighth, the ball had entered the integuments of the abdomen, about an inch and a half above the symphysis pubis, and had passed out of the inner side of the left buttock. In a ninth, the ball had entered the left groin on the inside of the femoral vessels, and had come out about two inches above the tip of the left buttock.

In several of the gun-shot wounds, in which the balls had passed across the loins, and through the region of the pelvis, complete or partial paralysis of the lower extremities was produced. In most of these cases, the paralysis had come

on at the moment of receiving the injury, though in a few cases not till after a longer or shorter interval. Many of the cases of paralysis of the lower extremities were accompanied with very severe pains, which were felt sometimes in the seat of the injury, sometimes in the course of the thigh, and in other instances in the knee, leg, and foot. We saw but few examples in which the paralysis produced by musket-balls passing in the region of the loins or pelvis, had affected both extremities. This was the case, however, in a man who had received a gun-shot wound in the loins, in which the ball had entered at the upper and middle part of the crest of the right os ilium, passed across the loins, and had come out nearly at the same place on the left side of the body. The paralysis in this case seems to have been occasioned by an injury of the spinal cord. In another case in which the ball had entered at the upper and middle part of the crest of the right os ilium, but had not passed out, complete paralysis of both limbs was also produced. Great swelling of the right thigh, leg, and foot took place. This man had severe pains of the left limb, but without swelling.

Most frequently the paralysis existed only upon one side, and this occurred in those instances in which the balls had entered the commencement of the limb above, as well as in, or below the groin. In one case, a ball had passed through the arm, and then entered the left side of the abdomen, a little way above the anterior superior spinous process of the ilium. From this it passed backwards about five inches, and was afterwards extracted. The power of moving the limb of the side on which the injury had been received was completely destroyed. In a second case, a ball had entered above the middle of the left os ilium, and was lodged. The whole of the left limb was affected with paralysis. In a third case in which a ball had entered immediately over the course of the obturator nerve in the left groin, and had passed out behind on the same side at the upper part of the anus, complete paralysis of the left limb was produced. In this case, it appeared to me that not only the obturator nerve, but also the schiatic had been divided. In a fourth case, in which a ball had entered nearly about the middle of the left os ilium, and was lodged, an immediate and complete paralysis of the limb of

that side had been produced. In a fifth case, in which a ball had entered immediately behind the right trochanter major, but without passing out, the paralysis of the limb was at first accompanied with an involuntary discharge of urine and fæces. The last-mentioned symptom of injury of the nerves went off, but the paralysis of the limb remained. In a sixth case, in which a ball had entered immediately over the trochanter major on the right side, and was lodged, the paralysis was accompanied with great pain, and was followed by an obvious diminution in the size of the limb, together with insensibility of the integuments on the posterior part of the leg. In another case, in which a ball had entered at the lower part of the left groin and had passed out through the sacrum, paralysis of the left thigh and leg was produced.

In many of the wounds of the pelvis in which a cure seemed to be taking place, their orifices were filled up with fungous granulations, indicating either the lodgement of some foreign body, or the existence of the process of exfoliation of bone. In one of the cases in which the ball had passed under the pelvis, it had fractured the tuberosity of the ischium.

Death had taken place in two instances from the occurrence of secondary hemorrhage, supposed to proceed from branches of the gluteal arteries.

WOUNDS OF THE INFERIOR EXTREMITIES.

Wounds of the Hip-Joint.

A CONSIDERABLE number of wounds occurred, in which balls had passed through the region of the hip-joint, or were lodged in or near to that cavity. The balls remained lodged in most of those instances in which they had taken a direction towards the joint, their force appearing to have been weakened or destroyed by the depth of the solid parts which opposed themselves to their progress. In some of the cases of wounds in the region of the hip-joint, a discharge of synovia had taken place, and put it beyond all doubt, that the capsule of the joint had been opened by the balls. In other cases in which this discharge did not appear, it was doubtful whether the capsule had been penetrated, or the joint itself much injured by the effects of the balls which had passed through

this region. In almost all the cases of gun-shot wounds in the region of the hip-joint, great swelling had taken place, which, in some instances, was confined to the region of this joint, though it most frequently extended from this over the whole of the limb.

In one case of wound of the hip-joint, the ball had entered immediately over the right trochanter major, and had passed inwards to the joint. The discharge of synovia was at first very considerable, but this had gradually diminished, and the patient seemed to be in a fair way of recovery. In another severe case of injury of the hip-joint, in which the ball was lodged, paralysis was produced, and great swelling of the foot and leg supervened. In one of the cases in which it was doubtful whether the ball had entered the joint, there was considerable swelling in the site of the trochanter major, with but little in the region of the acetabulum. On an incision being made into the swelling, the ball was found to be imbedded in the neck of the femur, from which it was extracted. A large abscess had formed in the posterior part of the thigh. On this patient dying, the neck and head of the thigh-bone, together with

the acetabulum, were found in a diseased state. In one of the injuries of this joint occasioned by a ball, an exfoliation from the side of the acetabulum had taken place, and the symptoms, both local and constitutional, were so mild as to afford hopes of a recovery by ankylosis. We saw several patients sinking under hectic fever, in whom extensive suppurations had taken place in the region of the hip-joint previously to death. In one of these, the bones of the acetabulum were found to be severely fractured, as was also the head of the thigh-bone, through which the ball had passed. In another, the brim of the acetabulum was fractured by a ball found lodged in the neck of the thigh-bone, and the articulating cartilages of the joint were destroyed by ulceration.

In other instances, the balls, without penetrating the capsule of the joint, had injured the parts which surrounded it, so as to have occasioned the formation of abscesses in the joint, and the ulceration of the articulating cartilages; together with the softening and absorption of the head and neck of the femur.

Wounds of the Thigh.

SEVERAL cases were to be seen in which large portions of the buttocks and of the thighs had been removed by cannon-balls. These wounds had at first a gangrenous look, and passed afterwards into a state in which they shewed but little disposition to heal, the granulations on their surfaces retaining for a long time a smooth and glossy appearance, notwithstanding every attention which could be given to the general and local treatment.

In the wounds made by cannon-shot, several instances occurred in which great swelling and protrusion of the muscles of the thigh took place. Where the wounds were small, as in those made by grape or canister-shot, the external protrusion overlapped the edges of the wound, producing, to a certain degree, the strangulation of the muscles. In these cases of protrusion, the return of the muscles was promoted by attention to the position of the limb, and, where it could be borne, by pressure on the protruding parts, by means of bandages or straps, while the inflammation was modera-

ted by a strict adherence to the antiphlogistic regimen.

In one case, a cannon-ball had struck the outer and fore part of the left thigh, and deprived the muscles of their covering. A protrusion took place from the wound, which occupied nearly the whole anterior part of the thigh from the groin to the knee. The surface of the protruded parts was irregular and knobby. Before we left Brussels, a considerable advance towards a cure had been made in this case by the limb being placed on the heel, and by the use of pressure with bandages.

Numerous examples were to be seen of cases in which musket-balls had penetrated the thigh in all directions. Many of these were simple wounds, and, unless in particular constitutions, healed very readily. In some instances, however, they were attended with a high degree of erythematic inflammation, which occasioned great swelling of the thigh, leg, and foot. This inflammation terminated not infrequently in abscess.

Various instances had occurred in which secondary hemorrhage had taken place from wounds in the course of the large vessels of

the thigh, in consequence of the sloughing of these vessels, occasioned by the contusion of the balls, and at a later period by attacks of hospital gangrene, as well as in consequence of the increased action of the vascular system. We were informed of three cases which had occurred in one hospital, in which the wounds were complicated with fractures of the thigh-bone, and in which secondary hemorrhage had proved fatal about the fifth day; and we had occasion to see several cases of gun-shot fractures of the thigh, in which hemorrhage had come on, from the twentieth to the thirtieth day, after the wounds had been received. In one case, the hemorrhage had come from the femoral artery, so near to the groin, that it became necessary to cut down upon, and tie the external iliac artery. Several cases had occurred in which it became necessary to tie the superficial femoral artery. In some of these, gangrene of the foot and leg supervened. Other instances again occurred of secondary hemorrhage from the femoral artery, in which it was deemed necessary to have recourse to amputation. We saw one case in which the femoral vein had been tied, in consequence of hemorr-

hage produced by sloughing from an attack of hospital gangrene.

Several remarkable instances occurred, in which balls had passed across and near to the blood-vessels of the thigh, without either primary or secondary hemorrhage having been produced. In one case, the ball had entered immediately above the pubis, crossed the fore part of the left thigh, and had come out of the lower part of the tensor vaginæ femoris muscle. In a second case, the ball had entered over the inner edge of the triceps of the right thigh, crossed the femoral vessels, and come out over the upper part of the rectus cruris. In a third instance, the ball had entered above the external condyle of the right knee, run up along the fore and inner part of the thigh, and had come out near to the root of the scrotum. In a fourth case, a ball had entered a little below and to the fore part of the trochanter major, crossed the right thigh, passed through both testes, and entering the left thigh, had passed through the whole breadth of its fleshy substance.

We saw two instances in which the femoral vessels had been exposed by foreign bodies,

without hemorrhage having been produced. In one of these, in which a ball had been split by the bones of the pelvis, one half of the ball was found lodged a little below the groin, close to the anterior surface of the femoral artery. In the other, in which a man had received several wounds from the splinters of a shell which had exploded near him, the feather-spring of a musket-lock was found lying across and pressing upon the femoral artery of the right side. The wound had a sloughy appearance, but it granulated and healed without the occurrence of hemorrhage.

A great proportion of the wounds of the thigh were complicated with fractures of the thigh-bone. This is always a severe kind of wound, and where the fracture is above the middle of the thigh, or near to the hip or knee-joints, is to be regarded as a very dangerous one.

The inflammatory swellings, which are the consequences of compound fractures of the thigh, had subsided in comparatively very few cases before we reached Belgium; and in a great proportion, particularly of those in which the fractures were situate in the upper part of the thigh, copious suppurations had taken place,

which separated the muscles from one another, and formed abscesses of greater or less extent in different parts of the thigh. The process of the re-union of bones, by which fractures are healed, could scarcely be said to have commenced, unless in a few favourable cases : indeed, in most, the first period of inflammation had not terminated.

A greater or less shortening of the thigh, the displacement of the fractured extremities of the bones, and distortion of the limb, are well known to be among the more usual consequences of almost all fractures of the thigh-bone. In those cases in which the fractures were situate above the middle of the thigh, this shortening, displacement, and distortion, took place to a great extent. In one case there was great shortening of the limb, with hard swelling and much thickening of the thigh, which gave to it the appearance as if it had been affected with osteo-sarcoma. In placing the hand upon this thigh, the muscles were felt to be in a state of constant intermittent spasmodic contractions. These contractions were extremely powerful, and were accompanied by a general, but slight tetanic affection of the other muscles of the body. In

the progress of this case, abscesses formed in the course of the thigh, and, notwithstanding every care which could be taken, protrusion of the fractured extremities of the bone took place to a great extent, and the patient sunk gradually under attacks of hectic fever. We saw other cases in which considerable contraction, with hard swelling of the muscles, and shortening of the thigh, had taken place, but without intermission in the contractions, or the formation of abscesses.

In the progress of the treatment of the compound fractures of the thigh, counter openings became frequently necessary, and were of much advantage in the greater number of instances in which we had occasion to see them made. In several instances in which suppuration had taken place to a great extent, the more depending orifices of the wounds having closed, the matter accumulated round the fractured extremities of the bone, destroyed the cellular membrane which connected the muscles together, and could find an exit only through the openings on the fore or lateral parts of the thigh. These collections of matter were generally accompanied by diffused œdematous, and some-

times inflammatory swellings of the whole limb up to the trunk of the body, and were attended with severe symptomatic fever, terminating in hectic fever and colliquative diarrhœa. In some of these cases, from the swellings, and sense of fluctuation which is felt over the whole limb, the surgeon is occasionally liable to be deceived, not only with regard to the seat, but sometimes even with regard to the existence of abscess. In such cases, however, the incisions which were made, seemed to me to afford relief, by the evacuation which they procured for serious extravasation.

In making the counter openings which were necessary for the evacuation of matter, and the extraction of foreign bodies, it was in general found that numerous splinters and fragments of dead bone existed in the neighbourhood of the fracture; sometimes in a loose and detached state, but, in other instances, forming greater or less portions of the extremities of the fractured bone, and, by their presence, preventing the possibility of reunion. It is this state of gun-shot fractures which retards so remarkably the process of their reunion, and renders it often a matter of indifference, in the early stages

of these fractures, whether the extremities of the bones be or be not brought into contact. These portions of bone must come away by exfoliation, and months, or even years, may be required for the completion of this process. Not unfrequently the dead and exfoliating extremities of the bones are surrounded by callus, or new bone, through which they must pass and be discharged before a cure can be finally completed.

In gun-shot fractures of the thigh, the limb may, in general, I believe, be placed in the semi-bent position, without splints or bandaging, till the twentieth day, or even till a later period. It was only when the inflammatory symptoms had been subdued by the use of the general and local antiphlogistic regimen, and the process of reunion was about to take place, that it appeared to me that advantage was derived from placing the limb in the extended position, or from the application of splints and bandages. Even at this period, it often required great attention in the application of bandages, to prevent the œdema and gangrene, which, when unskilfully applied, they are so liable to produce. It is only by placing the limb in the extended position,

that it is possible to judge of the degree of shortening and distortion which have taken place in the limb ; and it is in this position only that we can propose to remedy these, by making, from time to time, such extension of the limb as the state of the soft parts may admit, and to counteract, by position, splints, and bandages, that tendency to displacement of the ends of the fractured bone, and distortion of the limb, which are produced partly by the action of the muscles, and partly by the weight of the inferior part of the extremity. We saw excellent effects produced in numerous instances, by the application of rollers to the foot and leg, while the soft parts more immediately surrounding the fracture were more gently compressed by the eighteen-tailed bandage, or by the bandage of Scultetus, applied so as to admit of and to facilitate the discharge of the matter from the abscesses and sinuses which had formed in the neighbourhood of fractures.

We saw various instances of fractured thighs, in which attempts were making to prevent the shortening and distortion of the limb, by the application of the apparatus for permanent extension. This apparatus has a very im-

posing appearance ; and the purpose for which it is directed to be used is so desirable, that it is likely to receive a fair trial from military surgeons, as well as from those who are engaged in the practice of civil life. I have tried this apparatus repeatedly myself, and have seen it used under various modifications, in different countries of Europe, and yet I am doubtful whether it possesses any very great advantages over the extension which is made from time to time with the hands, aided by the use of long splints and proper bandaging. The great difficulty in the practice of permanent extension is to find points of support, upon which to continue with effect, and, at the same time, without injury, the extending and counter-extending powers. It must be left to future experience to determine whether, even in its simplest form, this apparatus is not a thing better calculated to amuse the rich, than to be of real service to the poor.

Nothing can be more laudable, or better deserving of the imitation of English surgeons, than the great pains which the French surgeons in general bestow upon the management of fractured limbs. If, in the earlier stages of these injuries, they sometimes err by trusting

too much to mechanical means, it would be unjust not to acknowledge, that they excel us in the after treatment, by the very great attention which is given daily at each dressing, to the condition, position, and bandaging of the limb.

Wounds of the Knee-joint.

IN referring to my notes, I find that we have taken notice of the principal symptoms that had occurred, in more than sixty examples of wounds of the knee-joint. Most of these wounds had been inflicted by musket-balls ; but we saw a few which had been made by canister and grape-shot, and also some made by the lance.

In a great proportion of the wounds of the knee-joint, the local and constitutional symptoms were peculiarly severe. Several had died of these wounds, and others were in imminent danger of doing so, before the symptomatic fever could undergo such an abatement as to warrant the amputation of the limb. Great pain, tension, and swelling of the joint itself, was usually accompanied with œdema of the foot and leg, and not unfrequently with an erythe-

matous swelling of the whole limb. This erythematous swelling often extended up to the trunk of the body, and rendered it impossible to perform amputation in cases in which the removal of the limb seemed to be the only means by which the life of the patient could be secured. It terminated, in some instances, in extensive abscesses round the knee, and in the cavity of the ham, which took the direction sometimes of the thigh, and sometimes of the leg. In other instances, this inflammation terminated in erysipelas, and, in others again, in gangrene and actual mortification of the foot and leg. In a few instances, it is true, balls had passed through, and in others they appeared to be lodged in the joint, or in the ends of the bones which compose it, without the patient's appearing to have suffered much from constitutional fever, or from local inflammation. These instances, however, were rare, in comparison with the number of those whose lives were in danger from the injuries which their knee-joints had sustained.

In the dissection of several of the knee-joints after amputation, I found that the balls, in passing through the joints, had fractured the ends

of the bones, and had occasioned, in the synovial membrane and cartilages, appearances very similar to those which occur in scrofulous affections of the joints. The cartilages were loosened, in some instances, from the bones ; in others, they were partially absorbed ; and, in the divisions of the cartilages produced by fracture, the edges were rounded off by absorption ; the synovial membrane was much thickened in substance, and covered by soft, velvet-like, spongy granulations.

One of the more remarkable changes which we observed to take place, during our stay in Belgium, in the appearance of wounds of the knee, and other joints, which seemed to shew a tendency towards recovery, was the resemblance which they gradually acquired in external form and in feel, to joints affected with chronic inflammation, or white swelling. Many of those in whom I had at first conceived amputation would have been required, had, before we left that country, so far recovered as to be able, some of them to use their limbs, and others to suffer them to be moved from the bed on which they lay. In a very great proportion of these cases, the wounds had healed,

but the joints remained swollen and stiff, and had assumed the appearance of incipient white swellings. In several of the cases in which the joints had put on this appearance, they were attacked, from apparently slight causes, by violent pain, great heat, and considerable swelling. In these inflammatory and acute attacks, great, and often sudden relief, was procured by the repeated application of a great number of leeches. The changes in the appearances of wounded joints to which I have alluded, have made the stronger impression upon my mind, that I do not recollect that they have been distinctly pointed out by any writer upon military surgery. How many of the cases in which these changes had taken place would yield to the usual remedies, and what proportion would ultimately require amputation, are points which it will be curious and useful to ascertain.

Wounds of the Leg.

THE local and constitutional symptoms which accompanied the compound fractures of the

legs, had a great resemblance to those which I have already mentioned as occurring in the compound fractures of the thigh. In general, however, these symptoms were less severe, and, consequently, the chance of ultimate recovery much greater, than in the fractures of the thigh, particularly those which had their seat in the upper part of that bone.

Some of the worst fractures of the leg which we saw, were those situate near to the ankle joints, in which the inflammation had been communicated from the original wound to the parts which enter into the formation of these joints.

Most of the fractures of the bones of the leg were of the comminuted kind, accompanied with numerous splinters of bone. We saw but few instances in which a ball had passed through the tibia without fracturing it. Besides those in which this had happened in wounds of the tibia, near to the knee-joint, we saw also one very remarkable instance of a ball having passed through this bone without fracturing it, at about five inches below that joint.

In some instances, balls appeared to have run along the soft parts, in the direction of the ex-

tremities of the bones, and in other instances, to have passed through between the tibia and fibula.

Several instances occurred in which the balls were lodged in the tibia, and others in which it was doubtful whether they had passed through and out of the limb. A ball in one case had entered the upper, fore, and outer part of the leg, and seemed to have taken a direction backwards to the ham. Various attempts were made to discover it with a probe introduced into the wound, but without success. An abscess, after some time, formed over the upper and inner extremity of the gastrocnemius muscles, from which, upon opening it, a bit of the pantaloons was taken out. Small fungous granulations protruded for some time from the extremities of the wound, but these yielded to the application of escharotics and pressure, and the wounds healed up without the ball being discovered, or any sensible exfoliation of bone having taken place. Whether the ball will ever discover itself is one of those problems which time only can solve.

The process of the reunion of the bones of the leg had begun, and was completed in several cases before we left Belgium. In some in-

stances, however, that process had been prevented by the extensive destruction and death of bone; in some, by attacks of great inflammation and extensive abscesses separating the soft parts surrounding the fractured extremities; in some, by the formation of soft unhealthy fungating granulations, which passed between the ends of the bones and through the orifices of the wounds; and in others, apparently by backwardness in the parts injured to form healthy callus.

We saw numerous examples in which the compound fractures of the leg had been followed by attacks of erythematic inflammation, which extended up even to the trunk of the body, and prevented the possibility of performing amputation in cases which otherwise might have been benefited by that operation. In one case, at Antwerp, we saw mortification of the foot and leg succeed to a wound which was situated immediately below the knee-joint. In this, as in various other instances in which mortification of the limb had ensued, there was no reason to believe that the affection was occasioned by any injury done to the principal blood-vessels.

Several cases of secondary hemorrhage occurred in which it was necessary, in some instances, to apply ligatures and compression to the arteries, and in others even to remove the limbs. In one case, a ball had entered the head of the right tibia, and passed out at the middle and outside of the leg. Secondary hemorrhage coming on, first a longitudinal, and afterwards a transverse incision was made over the exit of the ball, by which the extremities of the peroneal artery were exposed and tied. Great swelling of the divided muscles took place, but the hemorrhage did not recur.

Wounds of the Ankle and Foot.

THE injuries of the ankle-joint might be said to be almost equally severe with those of the knee-joint; and the symptoms and appearances which they presented, both in their first and secondary stages, resembled so completely those which have been already mentioned in speaking of the knee joint, that to enumerate them would only be to repeat what has already been stated at sufficient length. The swelling

of this joint was proportionally greater than even that of the knee. Fungous granulations protruding through the wounds, were more common, but the constitutional symptoms, though in particular instances severe, were, in general, far less so than in the gun-shot wounds of the knee-joint. Several cases of wounds of the ankle-joint had made considerable advances towards recovery; but it was obvious that a large proportion would require amputation. This was delayed in some instances till the inflammatory symptoms and fever should abate; and in others in which these had abated, till the minds of the patients could be reconciled to the loss of the limb.

Various instances presented themselves of gun-shot wounds of the foot. In some of these the balls had passed between the soft parts and the bones on the under as well as upper part of the foot. In other instances, the balls had passed through the foot in every direction, and had fractured the tarsal and metatarsal bones. These fractures were always accompanied with great swelling, which depended on the communication of inflammation from the wound to the contiguous ligaments and articulating sur-

faces. A few examples of secondary hemorrhage occurred, in which the hemorrhage was suppressed by compresses and proper bandaging. In many instances, exfoliations of bone were taking place, fungous granulations protruded, and other appearances presented themselves, which seemed to indicate that amputation would still be required.

WOUNDS OF THE SUPERIOR EXTREMITIES.

Wounds of the Shoulder.

SEVERAL examples occurred in which the clavicle had been fractured by balls passing through it. In some instances, these balls had entered on the anterior, and, in others, on the posterior part of the body: most frequently they had passed through and out of the body, but in other instances they were lodged. The clavicle was fractured, in some instances, by musket-balls, without the sac of the pleura being opened; in others, the fracture of this bone was complicated with wounds of the chest. That tendency which the shoulder has, in the fractures of the clavicle, to fall inwards, forwards, and a little downwards, was very apparent in the wounds of this bone. In one of these, the ball had entered the middle of the

clavicle, and was lodged without the situation of the ball being known, or its appearing to have produced any considerable injury of the chest or shoulder. In another case, a musket-ball had struck the uppermost button of the jacket, on the right breast, and then entered the body under the middle of the clavicle, carrying in a splinter of that bone, but without fracturing it. In a third case, an iron cannister-shot had entered and fractured the right clavicle, passed through, and was cut out from under the spine of the scapula. The wound bled profusely, the patient vomited blood copiously on being wounded, and spat blood for three weeks. The spitting of blood had ceased when we left Belgium, and the wound was healing rapidly, with a return of his strength and health, but the shoulder-joint continued stiff. In another instance, the ball, entering at the middle and upper part of the right scapula, had passed through and broke the clavicle near to its middle: the ball was divided into three portions, which were successively discharged. In a fifth case, the ball had entered at the back and upper part of the left shoulder, and was cut out of the middle of the clavicle which it had fractured.

A variety of cases presented themselves, in which severe wounds had been inflicted in the region of the axilla and shoulder-joint. In several of these, balls had passed through in the immediate vicinity of the large blood-vessels situate in this region, and, in some instances, had divided branches of the axillary plexus of nerves, as was obvious from the paralysis which had been produced. In one very remarkable case, an iron shot, about an inch and a half in diameter, had entered the fore part of the left shoulder, below the clavicle, and about two inches from its outer extremity, and had passed out behind at the external edge, and a little below the middle of the scapula. The pulsations of the subclavian artery were at first visible in the wound, but had ceased to be so when we last saw this patient; the ball seemed to have passed on the upper and outer side of that artery. This patient could move his fingers, but had no power over the arm or shoulder. In another case, a musket-ball had passed through the same course, and had produced precisely similar effects. In a third wound, apparently in the same direction, paralysis was not produced. In a case where the ball had entered at the inner extremity of the clavicle, and

passed out of the posterior part of the shoulder, paralysis of the arm had been immediately produced; but in another case, in which the ball passed through the lower and outer part of the axilla, palsy did not occur.

In the wounds of this region, the scapula was occasionally perforated. In one case, the ball entered the inner and upper side of the shoulder-joint, and was cut out below the spine of the scapula; in another, the ball entered near the external edge of the pectoral muscle, passed through the lower part of the axilla, and out through the scapula; and, in a third case, the ball had entered behind through the outer edge of the right scapula, and passed out on the inside of the shoulder. This patient retained the power of moving his fingers, but had lost that over the other parts of his arm. We heard of one case only, in which death had taken place in consequence of secondary hemorrhage from the subclavian artery.

A variety of cases occurred, in some of which the shoulder-joint had been struck, and others, in which it had been laid open by grape-shot and by cannon-balls. In some of these cases amputation had been performed; in others, attempts were making to cure the injuries with-

out the removal of the limb. In one case, a ball had carried away the integuments on the upper and fore part of the joint, together with the greater part of the deltoid muscle, and had shattered the head of the humerus. The head of the humerus exfoliated, and about seven weeks after the injury, four inches of the upper part of that bone were removed from the socket. Pains were taken to bring the soft parts together, by means of adhesive straps. The appearances were favourable beyond what could be expected in an injury so severe. In another case, also, which seemed to promise favourably, the greater part of the deltoid muscle had been removed by a cannon-shot; but the joint itself was not exposed, nor did the head of the humerus appear to have been much contused. Appearances were less promising in a case in which a cannon-ball had carried away the upper part of the left deltoid, and had laid open the joint. In another case, in which the upper part of the deltoid was carried away, the acromion process protruded, and seemed as if it would exfoliate. In one case, a cannon-ball had struck the posterior and upper part of the arm, but did not produce discolouration of the skin, or occasion

any immediate apparent injury ; a very extensive and troublesome ulceration, with destruction of the integuments on the posterior part of the arm, ensued, and another ulceration was forming over the dorsum of the scapula. These local symptoms were accompanied by great debility, and much nervous irritation. In another instance, a shell had glanced over the posterior part of the shoulder and dorsum of the scapula, without lacerating these parts ; but it had occasioned an extensive ulceration, by which they were removed.

We saw numerous examples in which pieces of grape-shot and musket-balls had passed over the region of the shoulder-joint, without seeming to have penetrated its cavity. In a great proportion of the cases of these wounds made by musket-balls, the balls had entered upon the arm, near the insertion of the deltoid, and had passed upwards, over or through this muscle, generally to the back part of the scapula, and more rarely to the fore part of the neck. These wounds were generally in the left shoulder, and seem to have been received when the arm was in an extended position. In one very remarkable case of this kind, the ball had en-

tered on the inner side of the insertion of the deltoid, and come out at the root of the neck, immediately above the inner extremity of the clavicle, appearing in its course to have passed through the axilla and under that bone. A large portion of the first rib exfoliated; but neither hemorrhage, paralysis, nor injury of the parts contained in the chest, seemed to have been produced. In another case, the ball had entered at the outer and middle part of the left arm, and had come out on the same side at the inner extremity of the first rib which it had fractured. The balls in some instances had entered near the top of the joint, and passed out at the posterior part, or were lodged among the muscles at the root of the neck. In one case, a grape-shot had entered immediately over the acromion process, and passed out at the back, near the posterior edge of the scapula. In another, a musket-ball had entered nearly at the same place, and was cut out from over the middle part of the dorsum of the scapula: and in another, the ball had entered the deltoid muscle, immediately over the head of the humerus, and was lodged; a small deep-seated tumor was felt at the root of the neck, under the edge of the

trapezius and levator scapulæ muscles, on cutting into which the ball nearly divided, and, with small portions of bone adhering to it, was extracted. The fracture of the acromion, without any great injury of the joint itself, by balls passing in this region, was a frequent occurrence, and was in general attended with no other bad consequence, than the cure being rendered tedious by the exfoliations which took place.

We saw various cases in which, in consequence of severe injuries of the shoulder-joint, amputation had been performed on the field during the action ; and others, in which it had become necessary to perform that operation at subsequent periods. A few seemed to be in a state of recovery in whom balls had actually passed through the shoulder-joint ; and several in a state which would probably require amputation on the subsidence of the secondary constitutional symptoms by which they were attended. Even in the greater part of those cases which had the most promising appearance, a great degree of swelling continued to exist, accompanied by extensive suppurations, fungous protrusions from the wounds, and exfoliations

of the bones, with their usual constitutional symptoms. In one of the cases in which we saw amputation performed at the shoulder-joint, the ball had entered on the outside of the right arm, about four inches from the top of the shoulder, and passed out near to the coracoid process. The head of the humerus was broken into several pieces. The ball had passed anterior to the nerves and vessels of the axilla. In one of the cases of amputation, it was found necessary to remove the neck of the scapula, and a portion of the extremity of the clavicle, on account of the injury which these parts had sustained: this patient was doing well.

We saw a case in which a ball had entered about two inches below the clavicle, near to the coracoid process, and had passed under the acromion to the back and outer part of the shoulder. In another case, the ball had entered on the anterior part of the shoulder, and seemed to be lodged in the head of the humerus; and in another a ball had passed through the head of the humerus. In none of these three cases was any great degree of swelling or inflammation produced. In one case, in which a musket-ball had passed through the right

shoulder-joint, at the end of the sixth week the wounds had healed, but the joint remained stiff and immoveable.

Wounds of the Arm.

WE saw several cases in which abscesses had formed under the deltoid muscle in consequence of balls having passed across the arm, through the inner surface of that muscle. In some of these cases, exfoliations of the bone took place, and counter openings were required to facilitate the discharge of the detached portions and the evacuation of the matter of suppuration.

Two instances occurred of secondary hemorrhage from the brachial artery, in each of which it was necessary to lay bare and tie that vessel. In the first, after several weeks, the pulsation at the wrist had not returned. In the second, sphacelus of the fingers, and gangrenous inflammation of the fore-arm, were produced, and the arm was amputated above the elbow, but below the place where the ligature was applied to the brachial artery.

In one case of wound of the humerus at its

upper part, secondary hemorrhage came on about the eighth day, and recurred several times, probably from the sloughing of some considerable arterial branch, produced by contusion of the ball. In two cases of wound of the arm, a pulsation was visible on the surface of the pus which filled the sore; but it was doubtful whether this was communicated from the brachial artery, or from an increased action on the inner surface of the extensive sinuses formed on the arms.

Wounds of the Elbow-joint.

WE saw a great variety of wounds of the elbow-joint, some inflicted with the sabre, some with the lance, but the greater number with musket-balls. In almost all of these, great swelling, pain, and tension of the joint, with œdema of the arm, fore-arm, and hand, had occurred. Many cases, in consequence of the formation of abscess, and the exposure of the ends of the bones, would require amputation. Those in which the wounds were healed up, or were closing, seemed to be passing into a state re-

sembling that of white swelling. In some of these, from the pain and swelling which existed, there seemed reason to think that amputation would be required; in others, recovery would probably take place by ankylosis, without its being necessary to have recourse to operation. In one case, a ball was lodged in the elbow-joint without any great degree of swelling or inflammation. In another, an olecranon which was fractured had been dissected out, and the patient seemed to be in a fair way of recovery.

Wounds of the Fore-arm and Hand.

IN several of the gun-shot wounds of the fore-arm, secondary hemorrhage occurred, which rendered it necessary to perform amputation. In a lance-wound on the upper and outer part of the left arm, a considerable portion of the radius, including its head, was laid bare by ulceration. The rotatory motion of this bone continued to be easily performed.

In one case, a ball had entered about an inch above the wrist, and passed out between the

ring and little finger. Great swelling and accumulation of pus were produced in the course of the tendons of the wrist, and under the palmar aponeurosis.

Many of the gun-shot wounds of the wrist were accompanied with a great degree of swelling. In some of these, as in the wounds of the ankle-joint, fungous granulations protruded from the wounds, and seemed to render amputation necessary.

In the wounds of the palm of the hand, collections of matter frequently took place under the palmar aponeurosis, and extended up the fore-arm along the sheaths of the tendons. Many of the wounds of the metacarpal bones healed readily; those of the bones of the thumb and fingers, particularly of the thumb, were, like those of the bones of the great toe, usually accompanied with severe local and constitutional symptoms.

AMPUTATION.

To determine what are the injuries of the extremities in which amputation is required, and to discriminate the cases in which that operation is immediately necessary or proper, from those in which it may be delayed with safety and with reasonable expectation of advantage, are points of the greatest importance in military surgery.

It does not clearly appear from the records of medicine at what particular period these points first began to occupy the attention of medical men. Amputation was an operation very seldom performed by the older surgeons. Indeed, the improvements successively introduced by Parée, Morel, Petit, and others, were indispensably required, in order to enable sur-

geons to perform this operation without incurring the greatest danger from immediate or consecutive hemorrhage. "Sed id quoque," says Celsus, "cum periculo summo fit; nam sæpe in ipso opere, vel profusione sanguinis, vel animi defectione moriuntur." Almost the only cases in which the older surgeons, previously to the use of the ligature of the arteries, and of the tourniquet in amputation, ventured to remove a limb, were those in which mortification had taken place, and a separation had begun to manifest itself between the dead and living parts; and from the directions which they give in their writings to cut below, in, or immediately above the line of separation, it is obvious that no very dangerous hemorrhage could in general arise from their amputations.

Du Chesne is the first writer on military surgery in whose works I have found the recommendation to amputate in the severer injuries of the extremities; and it is worthy of remark, that he directs the operation to be performed before inflammation and other constitutional symptoms shall have supervened; but how long this recommendation remained a barren precept, or by whom it was first actually carried into

execution, I have not been able to ascertain.*

It is evident, from the writings of Wiseman, that he not only recommended and practised immediate amputation, but that it had begun to be not unfrequently performed by the military surgeons of his time.† Yet neither in his writings, nor in those of his predecessors, have I been able to find any examples recorded of immediate amputation performed above the knee. Nor is this to be wondered at, when we reflect that surgeons, from want of the proper means of suspending hemorrhage during amputation, seem seldom, if ever, to have been able to put in practice the ligature of the arteries invented by Ambrose Paré. Various authors, it is true, have mentioned the ligature of the blood-vessels in amputation, but more frequently with disapprobation than with praise; and if any examples occurred of its having been used in practice, I have not been able to find them in the writings of surgeons, from the time at which it was aban-

* *Traicté de la cure generale & particuliere des Archusades.* Par Jos. Du Chesne. A Paris, 1625, p. 143.

† *Chirurgical Treatises*, by Richard Wiseman. Third edition. London, 1696, p. 410.

done by Guillemeau, the favourite pupil of Paré, who had assisted him in his operations, till its re-introduction after the invention of the tourniquet. The invention and improvement of this instrument gave a new impulse to operative surgery, delivered surgeons from the fear of hemorrhage during the division of the larger arteries of the extremities; enabled them gradually to relinquish the use of the cauteries and to employ the ligature of the blood-vessels, and may justly be regarded, I conceive, as the foundation of all those improvements which have been since introduced into the operation of amputation. It is perhaps the knowledge acquired by the use of this instrument that has enabled the surgeons of the present day to dispense with its employment in the removal of the extremities, even at the place of their junction with the trunk of the body.

The French surgeons appear to have speedily availed themselves both in civil and military practice, of the advantages to be derived from the use of the tourniquet, and of the ligature of the blood-vessels, in their treatment of the severer injuries of the extremities, and to have ventured to perform operations which, without

the use of these means, must have been highly dangerous, or wholly impracticable. De La Charrière recommends amputation not only in mortification of the extremities, but also in fractures accompanied with comminution of the bones, laceration of the soft parts, injuries of the joints, and division of the principal blood-vessels.* Saviard, in his excellent book of Practical Observations, published in 1702, relates a case of compound fracture of the leg, with dislocation of the ankle-joint, in which he wished to have removed the limb, but was prevented from doing so by the unwillingness of the patient to submit to the operation. A recovery took place under his management; but this did not alter in any respect the opinion he had previously formed, that a leg in a condition similar to that of his patient's, ought, according to the rules of good practice, to be amputated.† These opinions of De La Charrière and Saviard were so very generally adopted in France, that the frequency of amputation among

* *Nouvelles Operations de Chirurgie.* Par Jos. De La Charrière. A Paris, 1692, pp. 272, 326, 327.

† *Nouveau Recueil d'Observations Chirurgicales, faites par M. Saviard.* A Paris, 1702, p. 200.

the military surgeons of that nation, appears to have become a common topic of raillery and reproach. From the relation of Dionis, it would seem that the mind even of Lewis XIV. was in some degree impressed with the popular belief on this subject, and that this monarch conceived the injured limbs of his soldiers to have been fully as much in danger from the surgical ardour of the assistant surgeons, as their lives had ever been from the fire of the enemy. But whatever may be thought of the apology of Dionis for his younger brethren, few will be disposed to question the justness of his remark, that it is better to live with three limbs than to die with four.*

* L'opinion commune est que les chirurgiens ne demandent qu'à couper, et qu'ils sont au comble de leur joie quand, les ciseaux à la main, ils peuvent tailler en plein drap. Cette erreur s'est glissée jusque chez les Grands, et j'ai entendu dire au Roi, parlant des Chirurgiens Aides-Majors des Armées, qu'ils étoient fort empressés de faire ces opérations, et qu'ils comptoient leurs exploits d'une campagne par le nombre des bras et des jambes qu'ils avoient coupés. J'assurai le Roi que c'étoit l'opération qui faisoit le plus de peine au Chirurgien, et que s'il témoignoit de l'empressement de faire voir son adresse, c'étoit sur les opérations qui demandent de la délicatesse, et non pas sur celle-là qui exige de la cruauté, et qui devoit plutôt être faite par un Boucher que par un Chirurgien.

From the time of Dionis, to the publication of Le Dran's excellent little manual of military surgery, the cases of injuries of the extremities in which amputation was immediately or remotely required, became the objects of frequent consideration among surgeons, and led to the establishment of those rules of practice which are to be found in his work. In declaring himself an advocate for immediate amputation in all cases in which that operation from the first appears to be indispensable, Le Dran has, at the same time, stated briefly, but most distinctly, the comparative advantages of that practice, with those which may be expected

Lorsq'on fait quelque autre opération, c'est pour conserver la partie sur laquelle on la fait. Si on travaille, par exemple, sur un œil, c'est pour en corriger les défauts et le retablir dans sa fonction ordinaire; mais dans celle-ci, c'est pour détruire la partie, en la retranchant de son tout, non seulement comme inutile, mais comme pernicieuse, pouvant communiquer sa pourriture et ses mauvaises qualités au tout. Ainsi, ce qu'on se propose dans cette opération n'est pas la conservation de la partie sur laquelle on opere, mais celle de toute la machine qui périroit sans ce secours. C'est pourquoi le Chirurgien se trouve souvent contraint d'extirper malgré lui une jambe pour sauver la vie du malade; car il vaut encore mieux vivre avec trois membres, que de mourir avec quatre. *Cours d'Operations de Chirurgie. A Paris, 1707. Demonstration 9.*

from delay. His precepts, with regard to amputation, are obviously the result of much experience and reflection, and could not fail to have a powerful influence over the opinions and practice of his contemporaries and successors.*

Ranby, who was Sergeant-Surgeon to his Majesty King George II., appears, from his little essay on the treatment of gun-shot wounds, to have entertained opinions with regard to the utility of immediate amputation, similar to those of Le Dran, though he by no means enters so fully and accurately as that author had done into the discussion of this subject. In order to give immediate relief to the wounded, and to facilitate the performance of the necessary operations, Ranby proposes that the surgeons, during battle, should be collected into small bodies, and stationed in the rear of the army, by which means, he says, they would be enabled to assist each other, and to perform their duty with more exactness and dispatch.†

Such, indeed, was now the degree of improve-

* *Traité ou Reflexions Tirées de la Pratique sur les Playes d'armes à feu.* Par H. F. Le Dran. A Paris, 1737.

† *The Method of Treating Gun-shot Wounds.* By John Ranby. Third Edition. London, 1781, p. 29.

ment which had been attained in the operation of amputation, that the removal of the arm at the shoulder-joint had been repeatedly performed with success, and surgeons had begun to contemplate the possibility of taking off the lower extremity, even in the articulation of the hip-joint.

- It appears from the writings of surgeons, and particularly from the *Memoirs of the Royal Academy of Surgery of Paris*, that, for some years after the publication of Le Dran's work, amputation had been much employed in injuries of the extremities inflicted by fire-arms. But the want of success from this operation which had been observed on many occasions, and the recoveries which sometimes took place in cases which seemed at first to require it, but in which it had not been performed, led many practitioners to doubt whether amputation was a remedy in the injuries of the extremities so very useful or necessary as had been often represented. The frequent failure of amputation, of which the concurring testimony of military surgeons leaves no room for doubt, seems to have arisen from want of a due knowledge of the circumstances and period in which this operation ought to be performed; from the defective

management of hospitals; and, in part also, perhaps, from the imperfect state of the operation itself. The discussions which had taken place, and the diversity of opinion that prevailed among surgeons relative to the utility of amputation in the treatment of the severer injuries of the extremities, induced the Royal Academy of Surgery to draw the attention of surgeons in a particular manner to the consideration of this subject, by proposing the following question for the prize-essay of the year 1756. "L'amputation étant absolument nécessaire dans les plaies compliquées des fracas des os, et principalement celles qui sont faites par armes à feu; déterminer les cas où il faut faire l'opération sur le champ, et ceux où il convient de la différer, et en donner les raisons."

From the manner in which this question is expressed, it is obvious that some of those who proposed it were of opinion that there are certain injuries of the extremities in which amputation is immediately required, and others in which, though it may be apparent that it will become requisite, yet it may be proper or necessary to delay its performance. The first of these opinions seems to have been universally admitted by military surgeons. Even Faure,

whose essay on this subject was honoured with the prize of the Royal Academy of Surgery, and who regarded immediate amputation as a remedy full of danger, admits that there are several kinds of injuries of the extremities in which it is indispensably and immediately required. The enumeration which this author has given of these injuries is more full and distinct than any which had been published before his time ; and, what may appear singular, it does not differ in any essential respect from the enumerations given by later writers, who, in combating his opinions, have represented him as an enemy to amputation in almost all injuries of the extremities.* Faure was of opinion,

* Après tout ce qui vient d'être dit sur cet article, nous croyons pouvoir avancer cette proposition fondamentale, qu'à ne considérer l'amputation faite sur le champ qu'en elle-même, & sans égard aux circonstances qui peuvent l'exiger, de notables inconvéniens doivent s'y rencontrer, l'art ne pouvant jamais être d'accord avec la nature : qu'en conséquence, toute opération de cette espèce faite immédiatement ou peu après le coup reçu, doit être dangereuse dans ses suites ; qu'il ne faut pas s'étonner de voir périr une si grande quantité d'amputés ; & qu'enfin la nature semble demander qu'une opération de cette importance, qui porte un si grand trouble dans l'ame des blessés, & bouleverse à tant d'égards les fonctions naturelles de l'économie animale, ne soit point faite au moins dans le moment de la plus violente agitation, & quand le système général

that, in the less severe injuries of the extremities requiring amputation, it was more ad-

des solides est dans le plus grand érétisme. Mais comme il arrive souvent qu'une blessure se trouve si fort compliquée dans ses circonstances, qu'il y auroit un danger évident de différer l'amputation, comme par exemple.

1°. S'il étoit question d'un membre tronqué.

2°. Dans le cas de quelques grandes articulations fracassées, soit par le boulet, par la bombe, l'obus, la grenade, &c.

3°. Dans le cas d'une extrémité presque détruite, les os s'y trouvant éclatés, avec une déperdition considérable des parties molles . . .

4°. Si les os se trouvoient, pour ainsi dire, moulus dans une grande étendue, et les parties qui les avoisinent fort meurtries et contuses, avec déchirement des parties tendineuses et aponevrotiques.

5°. Si une articulation quelconque étoit fracturée avec lésion considérable aux parties ligamenteuses qui la tiennent affermie.

6°. S'il étoit question d'un tronc d'artère ouverte, d'où sortiroit incessamment une grande quantité de sang dont on ne pourroit se rendre maître.

Dans tous ces six cas, dis-je, la soustraction prompte de la partie lésée, est le seul remède que connoisse la chirurgie, à raison des accidens encore plus fâcheux, qui surviendroient indispensablement pour peu que l'amputation fût retardée. Car dans le premier cas, la nature ne pourroit réunir les parties sans le secours de l'art, à cause de l'irrégularité de leurs déchiremens et du décharnement de la partie osseuse, lequel s'étend plus ou moins suivant la force du coup. Ces circonstances nécessitent à l'opération immédiate, puisque tout s'y réduit à fond à couper plus exactement les parties déjà emportées par le coup ; ce qui ne doit souffrir aucun retardement.

Les accidens, dans le second cas, ne seroient guères moins fâcheux, tant par les douleurs intolérables dont le fracas des

vantageous to perform that operation at a late than at an early period. He seems to have

grandes articulations est toujours suivi, que par le spasme, les convulsions violentes, la fièvre aiguë, l'inflammation et la tension considérable de tout le membre ; suites toujours ordinaires du déchirement des tendons et des bandes ligamenteuses, des aponévroses et de la capsule lésées, et qui ne peuvent être prévenus que par une prompte amputation.

Il arriveroit dans le troisième cas, l'extrémité étant presque détruite par la ruine complète et profonde des vaisseaux, où tout le principe vital seroit anéanti, que la gangrène s'empareroit de tout le membre dans peu de tems. Ainsi il ne paroît pas que l'art pût employer d'autre moyen que l'amputation faite sur le champ.

Le quatrième cas présenteroit à peu près les mêmes inconvéniens ; les os de l'extrémité fracassée se trouvant presque moulus dans une grande étendue, les incisions que l'on seroit tenu de faire pour enlever une si grande quantité de fragmens osseux, qui occasionneroient de l'irritation par l'irrégularité de leurs parties, laisseroient, pour ainsi dire, l'extrémité sans appui, et la priveroient de beaucoup de parties molles : inconvéniens plus fâcheux que ceux attachés à l'amputation même, d'autant plus qu'une fièvre ardente, des convulsions et la gangrène, termineroient bien vite la vie du sujet.

L'amputation, dans le cinquième cas, ne pourroit non plus être guères différée, attendu la difficulté de prévenir les accidens terribles dont les déchiremens des parties de l'articulation sont toujours suivis, comme on vient de la remarquer dans le second cas. En effet, ces accidens sont les suites des dépôts considérables ; les parties qui lient l'articulation, seroient entraînées par la suppuration ; la synovie n'étant plus retenue par ses enveloppes, s'épancheroit malgré les précautions de l'art ; les blessés tomberoient dans le marasme ; ce qui formeroit tout autant de maladies dont la mort certaine seroit le triste effet : sentiment même conforme à l'opinion des plus grands auteurs.

been led to adopt this opinion from the unsuccessful result of early amputation, as it had been

La nécessité de recourir au même remède est si absolue dans le sixième cas, qu'il n'y auroit, comme on le sait, aucun instant à perdre pour l'employer ; la ligature promptement faite au vaisseau dans le cas dont il s'agit, où l'on ne pourroit se rendre maître du sang par aucun autre secours de l'art, étant le seul moyen praticable de sauver le vie au blessé.

S'il arrive cependant que quelques observateurs produisent des exemples contraires aux loix que nous venons d'établir, et indiquent un certain nombre de blessures de l'espèce, ou à peu près, de celles dont il vient d'être parlé, guéries sans amputation, comme nous en rapporterons nous-mêmes quelques exemples ci-après ; ces cas ne doivent être regardés que comme exceptions à la règle générale. Car l'on sent bien que ce n'est pas sur quelques cas particuliers que l'on doit asseoir les principes d'une méthode universelle : pour un membre que l'on parviendroit à sauver en n'amputant point, ou en différant l'amputation dans quelques-uns des six cas dont il vient d'être parlé, l'on exposerait une infinité de sujets à perdre la vie. Ainsi, en avançant que toute amputation est dangereuse dans ses effets, lorsqu'elle est faite dans les circonstances que nous venons de marquer, où toutes les parties du corps humain seroient dans un état de violence, avouons en même-temps qu'elle ne sauroit être différée dans les six cas mentionnés ci-dessus, sans exposer les blessés à une mort certaine.

Si l'art nous développe ici tout le danger de l'opération, il nous montre en même-tems l'indispensable nécessité de l'affronter ; c'est un hasard à courir ; un pas dangereux dans la carrière, où nous devons marcher, dont aucune route ne peut détourner. Ainsi ne cherchons point à en étendre les limites au delà des bornes que la nature semble prescrire : et renfermons nous au contraire dans la sphère des connoissances qu'elle nous a tracées. *Memoire, par M. Faure. Prix de L'Academie Royal de Chirurgie. 12mo. tom. 8me. p. 23.*

practised after the battles of Fontenoi, Raucou, and Laufelt, and from a belief that this want of success was to be ascribed to the too vigorous state of health in those on whom that operation had been performed. He insists particularly upon the impropriety of amputating, except in the occurrence of secondary hemorrhage or gangrene, before the abatement of the inflammatory or constitutional symptoms necessarily arising from wounds, which, he remarks, usually takes place from the fifteenth to the twentieth day; though he seems unwilling to admit that it is more dangerous to operate during the inflammatory stage than immediately after an injury has been received, and lays it down as a principle, that the longer the operation is delayed, the greater will be the chance of recovery.

It is much to be regretted, that those who have contended for delaying amputation should seldom, if ever, have attempted to define accurately the cases in which, it being apparent from the first that this operation would become necessary, such a delay is proper, but have usually indulged themselves in exaggerated statements of the danger of immediate amputation,

and in vague declamation against unnecessary and cruel mutilations. Almost the only attempt which has been made to define these cases, is that which is to be found in the Memoir of Le Conte, which, in 1756, was judged worthy of being published by the Royal Academy of Surgery of Paris, though not of being honoured with their prize. Nothing, I conceive, can show more distinctly the confused and inaccurate ideas at that time entertained by surgeons regarding the very nature of the points to be determined in the question under discussion, than the enumeration which has been given by this author of the cases requiring delay of amputation, "on account of the danger that would result from its immediate performance." From several of these cases, it is obvious, that the notion which Le Conte entertained, as to the extent of the period for immediate amputation, was extremely indefinite, and so far from being limited to a few hours after the reception of an injury, included the time when inflammatory and constitutional symptoms necessarily supervene. His enumeration of the cases in which amputation may "without danger be delayed," appears to me, however, to be possessed of considerable

merit, and to have been calculated to promote the views of the Academy, by defining those cases more precisely than had hitherto been done, and by checking the too indiscriminate performance of amputation which seems to have prevailed.*

* M. Le Conte arranges the cases in which amputation ought to be delayed, under two heads.

I.—*Cas ou l'on doit différer l'amputation, parce qu'il y auroit trop de danger à la faire sur le champ.*

1^r Cas. Lorsque la plaie compliquée de fracas des os, du bras, de l'avant-bras, de la cuisse et de la jambe, est accompagnée d'une commotion trop forte. Je m'explique; et de l'explication naîtront comme d'elles-mêmes les raisons du délai.

Par commotion trop forte, j'entends celle qui de la partie blessée s'étend à toute l'économie animale par la genre nerveux; on la connoît par ses suites, ou plutôt par ses effets presque momentanés: ce sont pour l'ordinaire la petitesse et la concentration du pouls, la syncope, les angoisses, la perte de la raison, les mouvemens convulsifs, le hoquet, le vomissement, les frissons irréguliers, avec roidissement de tout le corps, le froid universel, l'engourdissement général avec pensanteur, le changement de couleur, qui devient jaune, verte, plombée, &c. Ces effets, qui ne peuvent manquer d'être apperçus du chirurgien, pour peu qu'il soit attentif, l'obligent de différer l'amputation, sans qu'il soit nécessaire de les voir tous réunis. C'est assez du concours sensible de quelques uns pour le décider; peut même suffire d'un seul, tel que seroit le froid universel, l'engourdissement général, le roidissement de tout le corps, la convulsion de toutes les parties. Ces effets indiquent la com-

A short time before the Memoirs of Faure and Le Conte were received by the Acade-

motion dont je parle, et sont la preuve d'un étranglement qui arrête le mouvement musculaire, et intercepte la circulation.

2^d Cas. Trop de vigueur dans le blessé, jointe à la commotion.

3^{me} Cas. Mauvaises qualités des liqueurs. J'entends celles dont les causes sont internes, telles que quelque virus scrophuleux, scorbutique, vérolique, la jaunisse, la marasme, un vice épidémique de maladie contagieuse, une fièvre violente.

4^{me} Cas. L'état inflammatoire d'un viscère principal, tel que le pöumon, le cerveau, les meninges, &c.; une tension inflammatoire au voisinage de la blessure, qui s'étendrait jusqu'à l'endroit où se doit faire l'amputation.

5^{me} Cas. Défaut de pansement dans le premier temps.

6^{me} Cas. Mortification non bornée, sur tout lorsqu'au dessus de la plaie se trouve une tuméfaction phlogistique, qui s'étend au dessus de l'endroit où doit se faire la section des chairs.

II.—*Cas où l'on doit différer l'amputation, parce que l'on peut sans grand danger la remettre à un autre temps.*

1^r Cas. En général, lorsque le fracas en conséquence duquel l'amputation est jugée nécessaire, ne vient que du mousquet.

2^d Cas. Lorsque le fracas n'attaque l'os que dans sa partie moyenne, pourvu cependant que les circonstances ne soient pas les mêmes que dans le premier cas de la première partie; que la plaie contuse n'indique pas des accidens consécutifs dont le développement seroit à craindre, et que les parties charnues n'aient point perdu leur chaleur naturelle. Le cas s'étend à tous les grand os.

3^{me} Cas. Lorsque dans l'articulation du coude ou du genou, la fracture n'affecte point l'extrémité inférieure de l'humérus ou du fémur, quoique l'autre partie de cette articula-

my, a Memoir by Boucher, physician at Lisle, had been read to that body, containing observations with regard to gun-shot wounds complicated with fractures of the bones in or near to the joints, in which he endeavours to demonstrate the frequent abuse of amputation in these injuries. This author endeavours to support his opinions not only by the general results of his observation in military hospitals, but also by the particular detail of twelve cases successfully treated without amputation. Though Boucher seems to consider the treatment of the cases which he has described as an important deviation from the general practice established at his time, an impartial examination will be sufficient to shew that there

tion soit fracassée, si d'ailleurs les accidens ne sont pas urgens, l'on doit encore différer.

4^{me} Cas. Lorsque dans les plaies des jointures de la jambe avec le pied, et de l'avant-bras avec la main, les os de la jambe et du tarse, de l'avant-bras et du carpe, ne sont cassés ou brisés, qu'en partie, parce que l'éloignement du tronc, surtout quand les accidens ne sont pas extraordinaires, rend le progrès de la commotion moins dangereux dans ces parties, et que d'ailleurs une foule d'observations favorisent cette décision; inutilement les mettrions-nous sous les yeux de l'Académie.

5^{me} Cas. En général, lorsque les plaies compliquées de fracas des os ne sont point faites par armes à feu. *Memoire par M Le Conte. Prix de l'Acad. tom. 8me. p. 79.*

are few, if any, of these cases in which the most strenuous advocates of the present day for the practice of immediate amputation, would have deemed it necessary or proper to have had recourse to that operation. He allows that fractures by cannon-balls or bomb-shells, and gunshot fractures of the large bones, when accompanied by much comminution and displacement, admit of no other resource than amputation; and mentions that there is much more reason to hope for a successful result when the operation is performed immediately, or a short time after the wound is received, than when it is delayed to a later period.

It seems to have been the difference of opinion which existed between Faure and Boucher, with regard to the comparative advantages of immediate and delayed amputation, that induced the Royal Academy of Surgery to submit Faure's essay to Boucher's particular consideration. In consequence of this reference, Boucher presented a second Memoir to the Academy, in which he endeavours to establish the advantages of early amputation, and states his opinions with regard to the treatment of the injuries of the extremities, in a much more

distinct and accurate manner than he had done in his first memoir. In his second memoir, Boucher appears to have made a material improvement on the statement of the question proposed by the Royal Academy of Surgery. Instead of taking it for granted that there are certain cases in which amputation, though apparently necessary, ought to be deferred, he proposes, as the subject of his discussion, whether, in those cases in which there is a necessity for amputation, it be more advantageous to perform it immediately, or to defer it. In the discussion of this question, Boucher had the merit also of pointing out to the attention of surgeons, more distinctly than any preceding author, three different periods which occur in the progress of gun-shot wounds, and the comparative advantages and disadvantages of performing amputation in these several periods. In opposition to the opinion of Faure, he contends, that amputation is more advantageously performed during the first, than during either of the subsequent periods; and seems to have thought, not without probability, that Faure's unfavourable opinion of early amputation must have arisen from the unsuccessful termination

of operations performed during the second, not during the first, period of gun-shot wounds. Though an advocate for immediate amputation, Boucher, from the great confidence which he was disposed to place in the resources of nature, seems to have considered it as an operation requiring to be less frequently performed than it appears to have been by the military surgeons of his time.*

* Pour procéder avec ordre dans la discussion de cet objet important, il faut distinguer avant tout, les tems ou les divers périodes, dans lesquels l'amputation peut être pratiquée ; j'en distingue trois.

Premièrement, le tems qui suit immédiatement le coup porté, qui précède le développement des accidens. L'on sçait que dans les playes faites par armes à feu, la tension, le gonflement inflammatoire, les battemens, les douleurs vives, la fièvre, &c. qui en sont les suites ordinaires, n'ont pas lieu tout d'abord, et que ces simptoms tardent plus ou moins à se montrer selon la grandeur et la complication de la playe ; à quoi contribue aussi le tempérament ou la constitution du blessé.

Secondement, le tems où les accidens plus ou moins développés, sont plus ou moins propres à affecter l'œconomie animale.

Troisièmement, le tems où les grands accidens ont relâché de leur violence, ou sont absolument calmés ; tems requis par M. Faure pour pouvoir opérer avec avantage.

Le corps, dans le premier tems, et encore mieux dans le moment du coup porté, doit être censé en général se trouver dans l'état le plus sain, et l'œconomie animale dans l'assiette la plus régulière, qu'ils puissent être : or, cette disposition est sans

Bordenave, in some very sensible and judicious observations on gun-shot wounds, pub-

contredit la plus favorable pour le succès de quelque opération que ce soit. L'amputation faite hors de ce tems, doit occasionner plus ou moins de dérangement dans l'œconomie animale, selon le degré d'ébranlement que le développement des accidens aura produit dans le genre nerveux. C'est en conséquence de ce principe que l'on croit ne pouvoir faire trop tôt les incisions et les dilatations requises dans toutes les playes d'armes à feu.

En retardant l'amputation, lorsqu'elle est reconnue indispensable, les efforts de la nature tendans à la guérison sont en pure perte jusqu'au moment où l'on s'y détermine. C'est en vain que jusqu'alors elle s'est épuisée en suppurations continuées pendant le long espace du retardement supposé; il faut qu'elle fasse de nouveaux efforts qui doivent être portés bien au delà de ce qu'elle a fait précédemment. On sait que les grandes playes sont toujours fâcheuses, et souvent funestes, non-seulement par l'épuisement qui suit les longues et copieuses suppurations, mais encore par la fièvre qui accompagne nécessairement la suppuration, et qui la produit. Des playes d'armes à feu aussi considérables que celles dont il est question, supposent donc une fièvre proportionnée capable de porter le trouble dans l'œconomie animale, et de renverser les mesures de l'art les mieux concertées. Nous avons vu dans nos Hôpitaux, lorsqu'ils ont servi d'azyle aux blessés de Fontenoi, nombre de sujets être la victime de cette fièvre dans des playes, qui n'intéressoient guères que des parties charnues. Comment veut-on qu'un corps qui en a été tourmenté pendant un mois ou six semaines, soutienne mieux les assauts de celle qui doit avoir lieu pour la suppuration de la playe qui suit l'amputation, que s'il n'avoit pas essuyé la première ?

Mais le danger du retardement ne se borne pas là. L'on a

lished in the same volume with the second Memoir of Boucher, enters very briefly into the

encore à combattre les effets de la meurtrisseure ou du déchirement des parties tendineuses et aponévrotiques, l'irritation des parties nerveuses par la présence des pointes des os cassés, l'inflammation de ces parties, le gonflement excessif du membre, les douleurs vives que suivent les convulsions, les fusées d'abcès, la gangrène. et en conséquence les redoublemens de fièvre, le délire, le cours de ventre, en un mot, le renversement de l'œconomie animale. Les inconvéniens de l'amputation faite d'abord, sont-ils comparables aux funestes effets qui doivent s'ensuivre de cette chaîne d'accidens ? Combien de sujets seront assez heureux pour résister à leur violence, et pourront parvenir au tems marqué par M. Faure pour entreprendre l'amputation avec plus d'avantage ? Puisqu'on la suppose indispensable d'un commun accord, c'est que l'on a tout lieu de craindre que les accidens à naître du désordre de la partie ne fassent sur l'œconomie animale des impressions assez fâcheuses pour que les sujets succombent. Si l'on peut réussir à en amener quelques-uns à ce tems désiré, ce ne peut être que par des incisions répétées, des dilatations douloureuses, des débriemens très sensibles, qui ajouteront autant de surcroîts d'irritation au genre nerveux ; trop heureux d'y parvenir à ce prix ainsi ces sujets auront du moins à essayer plusieurs opérations pour une. Nous avons eu dans quelques-uns, réfugiés dans les Hôpitaux, des preuves malheureuses du peu de fruit à espérer du retardement en pareil cas : l'accroissement non interrompu des accidens jusqu'à la mort, a ôté toute espérance de ressource du côté de l'amputation.

On ne doit donc point s'attendre à voir, dans le cas posé, les blessés lutter avec assez d'avantage contre les accidens du second période, pour qu'ils parviennent au troisième. Ce ne sera que par un effet du hazard que quelques-uns, dans un certain nombre, y parviendront ; et il s'en faut bien que l'on soit

consideration of the subject of amputation. In declaring himself an enemy to the indiscriminate use of that operation, this author maintains, that it is often necessary in injuries of the extremities, and that in such cases it ought to be performed before the occurrence of the constitutional symptoms. Bordenave conceives amputation to be often required in military practice in cases in which it might be dispensed with in the more favourable circumstances of civil life. The necessity of removing the wounded from one place to another, prevents that rest upon which a cure so essentially depends, and renders the attempts which may be made to preserve fractured limbs not only useless, but injurious. The want of success from amputation which had been observed, he is disposed to attribute to the improper regimen of the wounded, to their bad habit of body, and to the impure air of the hospitals in which they

fondé d'espérer qu'un tiers des sujets atteigne ce tems désiré, comme on l'est de pouvoir réchapper le tiers de ceux à qui l'amputation sera faite dans le premier tems. Ainsi l'on sent la différence qui doit resulter de ce dernier parti, d'avec celui du retardement, en supposant même que les amputations faites dans le troisième tems fussent toutes suivies de la réussite. *Mémoires de l'Académie, tom. VI.*

are lodged, rather than to the effects of the operation itself; and he remarks, that in those cases in which this operation is not had recourse to, the wounded often sink under the trials that are made to preserve their limbs. He gives several examples of recoveries in wounds of the extremities without amputation, though he allows that such examples can by no means afford sure and invariable rules for the conduct of the military surgeon.*

Opinions in several respects similar to those maintained by Boucher, were adopted and strenuously defended by Bagieu, in a series of memoirs addressed to the Royal Academy of Surgery, and published with the approbation of that body. In the examination of Faure's opinions and practice, Bagieu agrees with Boucher in maintaining, that the proper reason for delaying amputation is to ascertain, in doubtful cases, whether a cure may not be accomplished without it, and not, as had been imagined by Faure, the greater safety of that operation when performed at a later period. Bagieu has not stated very distinctly his opinion with regard

* *Memoires de l'Academie*, tom. VI.

to the period at which amputation may most advantageously be performed, though it is plain, from what he has said, that he dissented from that which Boucher had given in favour of early amputation. His mind does not seem to have been sufficiently impressed with the dangers which Boucher had pointed out of operating during the second period; and, notwithstanding the success which had attended Faure's practice, Bagieu contends, that it was injudicious to have allowed the strength of his patients to have been so much reduced before he removed their limbs.*

Both Boucher and Bagieu agree in alleging, though apparently without any good foundation, that several of the cases in which Faure operated might have been cured without amputation; and they endeavour to support this opinion by a reference to a number of instances of the severer injuries of the extremities in which a cure had been effected without the loss of the injured limbs. It is obvious, however, from the examination of the cases related by

* Examen de plusieurs parties de la Chirurgie. Par M. Bagieu. A Paris, 1756. Memoires sur l'Amputation.

these authors, that few of them were of the kind which military surgeons had in general regarded as indispensably requiring amputation, and that these few, instead of being considered as examples to be followed in practice, ought to be considered as exceptions to those general rules respecting the cases requiring immediate amputation which had been so well laid down by Faure, but which had been entirely overlooked both by Boucher and by Bagieu in their criticisms upon his essay. It is curious enough to remark, that in the relation of cases which had recovered without amputation, no instance is mentioned by any of these authors of a wound in the hip-joint; few, if any, of the fractures of the thigh, particularly at its upper part, and but a small number of wounds of the joints of the knee and shoulder; all of them injuries which, from their frequent occurrence in battle, must have often come under their observation.

Soon after the publication of the *Memoirs* to which I have alluded, Bilguer, surgeon-general to the armies of the King of Prussia, gave an entirely new turn to the discussion concerning amputation by the doctrines contained in an

inaugural dissertation printed at Hallé in the year 1761.* The main object of the author in that essay is to demonstrate, that the cases in which amputation is necessary, are much less frequent than had been supposed, and that it might even almost totally be dispensed with in every case of injury arising from fire-arms. Bilguer was led, as he informs us, to adopt this opinion, so contrary to that of all preceding military surgeons, from what had passed under his own inspection in military hospitals. He had observed that few, if any, wounded men recovered on whom amputation had been performed, while many who had their limbs carried off by cannon-balls, or who had received severe injuries of the extremities, were cured without being obliged to submit to amputation.

There is little reason to doubt that there was some foundation for that part of Bilguer's statement which relates to the want of success in the amputations performed by the Prussian surgeons. But it is difficult to determine what degree of credit ought to be given to any state-

* *Dissertatio Medico-Chirurgica Inauguralis de Membro-
rum Amputatione Rarissime Administranda, aut quasi Abro-
ganda. Halæ, 1761.*

ments of a surgeon who, from his own relation, seems to have met with but little difficulty in curing mortifications of the extremities ; and it is equally difficult to reconcile the horror which Bilguer expresses at the slightest incision in amputation, with his recommendation of those free and extensive incisions which he practised in the treatment of mortification.

A want of success similar to that which is mentioned by Bilguer, though by no means to the same degree, had often been observed by the surgeons of other nations to attend the practice of amputation, and its existence is admitted by most practical authors who had written before or about this period. The experience, however, of our own times has fully shewn that this want of success could not be owing to the dangers necessarily attendant upon the operation, but must have proceeded from the defective manner, or improper circumstances, in which it had been performed. It would appear that Bilguer had seldom, if ever, seen amputation performed during the first period of the injury, and that he was little aware of the increased dangers of performing it during the second. The mention which he

makes of the bad air of hospitals, will easily enable any one who has ever seen the mortality which attends operation among wounded men who are crowded together in close apartments, without the attention which is necessary to cleanliness and ventilation, to account for that want of success which Bilguer has made the foundation of his argument against the practice of amputation.

The account which Bilguer has given of the success of his practice, wants all that minuteness of detail which could give it interest or render it useful. With an appearance of accuracy as to the comparative number of those who died with and without amputation, he leaves us in complete ignorance of every circumstance upon which it is possible to found anything like a rational judgment with regard to the advantages or disadvantages of his practice. In order to form such a judgment, we must be made acquainted with the local situation and accommodation of the hospitals into which the wounded were received; with the diseases of the climate; with the season of the year; with the healthy or unhealthy constitutions of the air; with the treatment of the wounded; with the period, man-

ner, and circumstances in which amputation had been performed; and with the particular causes from which their death in individual cases seemed to proceed; but we shall look in vain for such data in the indefinite, imperfect, and barren observations of Bilguer. Even according to his own statements, one half of those who had gun-shot fractures of the extremities died, and of the remainder, more than one half were left in a state totally unfit for any kind of employment, civil or military. That out of 6618 patients he should not have been able to adduce more and better instances of recovery than the few which he has related, must astonish every one who has seen even the hundredth part of this number of wounded soldiers.

De La Martiniere, in a paper to be found in the *Memoirs of the Academy of Surgery* for the year 1768, defended the practice of amputation, in the severer injuries of the extremities occasioned by gun-shot, from the charge of inhumanity which had been brought against it by Bilguer. This author declares himself in favour of delayed amputation, and insists particularly on the utility of early and extensive incisions in gun-shot wounds. But his *Memoir* contains no ana-

lysis of Bilguer's practice or cases, nor any new or additional facts with regard to the utility of amputation. Neither does he give any cases or results of practice upon which to found a judgment of the utility or inutility of that operation, in addition to those which had previously been published by Faure, whose opinions he seems implicitly to have adopted.*

Morand, in his *Opuscles de Chirurgie*, published also in 1768, enters into an examination of the statements and reasonings of Bilguer, and endeavours to shew that these are, in many respects, inaccurate and contradictory. He defends, with De La Martiniere, the academy of surgery, from the imputation of cruelty insinuated by Bilguer, but more openly expressed by his translator, Tissot. He seems to think that the reproach of cruelty, so unjust in itself, came with a peculiarly ill grace from one who had recommended, and from one who had approved of numerous, deep, and extensive incisions through the soft part of limbs injured by cannon-balls,

* *Memoire sur le Traitement des Plaies d'armes à feu. Par M. De La Martiniere. Mem. de l'Acad. Roy. de Chirurgie. Tom. ii.*

or affected with mortification, incisions equally painful, and much more hazardous in their consequences than those which are made in amputation. Morand expresses his surprise, as he well might, at the boldness with which Bilguer speaks of amputation in the hip-joint, the only kind of amputation for which he seems to think there can ever be any occasion. The dressings and bandaging which Bilguer had recommended for the consolidation of broken bones, Morand regards as, in many respects, better fitted to retard than to promote that process; and he censures and ridicules the number, complicated nature, and great expence of the formulæ of medicines prescribed by Bilguer, which, as he justly remarks, could be seldom, if ever, employed in military practice. To prove that amputation was by no means so fatal an operation as Bilguer had represented, he mentions three instances in which it had a short time before been performed in the thigh by Sabatier with the happiest success; and adduces, as an undeniable proof of the safety of this operation, that about one-fourth of the pensioners in the Hotel D'Invalides had suffered amputation.

A much more able and elaborate refutation of Bilguer's opinions was published some time afterwards by Van Gesscher, surgeon in Amsterdam. This author admits, that amputation is a painful operation, but he contends, that it is not much more so than the incisions practised and recommended by Bilguer. He denies that it is in itself dangerous, and maintains, that in the greater number of cases of amputation which prove fatal, the death of the patient ought to be ascribed, not to the operation itself, but to other circumstances. His enumeration of the cases requiring amputation corresponds very nearly with that of Faure, and with that author he seems to think, that those patients have the best chance of recovery on whom the operation is performed at a late period. Van Gesscher gives a number of examples, not only from his own practice, but from that of other surgeons, in which amputation had been performed with the best and happiest effects. He thinks it strange, that, in the account of his practice, Bilguer should not have mentioned any case in which blood-letting was required to subdue inflammatory symptoms, and, from

this and other circumstances, he regards his cases as equally inaccurate and unsatisfactory.*

Mr Pott, whose opinions, relating to all points of practical surgery, cannot fail to be regarded as high authority among military as well as civil surgeons, declares himself a friend to immediate amputation in the severer cases of compound fractures of the extremities, and criticises with much severity, but with justice, the statements and practice of Bilguer. His mind was strongly impressed with the danger of operating during the second period; and he has pointed out, in a most forcible and distinct manner, the motives which ought to influence the surgeon in the important determination which he is called upon to form, during the very short period after the infliction of an injury which is left for deliberation.†

Mr Pott's opinions, with regard to the frequent necessity of amputation in the severer compound fractures, were combated by Dr Kirk-

* Abhandlung Von der Nothwendigkeit der Amputation—Freyburg, 1775.

† The Chirurgical Works of Percival Pott. Lond. 1779, Vol. I. p. 450, and vol. III. p. 390.

land, who, from his observation of the success which attended the treatment of these injuries without amputation in private, and particularly in country practice, was led to consider Mr Pott's doctrines, with regard to this point, as too general. But it would have required, I conceive, much more numerous and distinct proofs than any which Dr Kirkland has adduced, to establish the accuracy of the statement which he has given of the great difference in the success which accompanied the treatment of compound fractures in public hospitals, and in private practice. At present there is no reason to believe that any such difference exists. So little, however, was Dr Kirkland afraid of the danger arising from the performance of amputation, that he conceived it to be less than that which occurs from those compound fractures which he asserts may so often, and so readily, be cured with the preservation of the limbs. In all cases requiring amputation, he considered immediate operation as more advantageous than delay, and admits the frequent necessity of performing it in public hospitals; and from this, as well as other parts of his writings, it is evident, that this au-

thor would have been an advocate for immediate amputation in the practice of the army.*

Schmucker, who had been for many years surgeon-general to the Prussian armies, published, in 1776, an essay on the subject of amputation, which, like every thing that has proceeded from the pen of that celebrated surgeon, is distinguished by the minute accuracy of observation which it discovers, and the soundness and practical utility of the doctrines which it contains. This author mentions, that, during his stay at Paris in 1738, the surgeons of the Hotel Dieu, were in the practice of performing immediate amputation in the severer injuries of the extremities, and that they inculcated in their lectures the propriety of doing this before the supervention of inflammation, mortification, or fever; he states also, that the French surgeons in the service of the King of Prussia, who had been educated at Paris, used to amputate wounded arms and legs without any distinction of cases. It was this conduct on the part of military surgeons, he asserts, that caused

* Observations of Mr Pott's General Remarks on Fractures, by Thomas Kirkland. Lond. 1770.

amputation to be looked upon by many with horror and contempt. But, in reprobating indiscriminate amputation, Schmucker considers the opposite extreme of entirely abandoning that operation to which these feelings seemed to have given rise, as a practice equally dangerous and absurd. He declares himself an advocate for immediate operation in all cases in which amputation from the first appears to be necessary, and insists, in a particular manner, on the greatly increased danger which he had observed to arise from operation during the second period. He gives a minute and circumstantial enumeration of those injuries, both of the upper and lower extremities, in which he conceived amputation to be necessary, and in many of which he had actually performed it with great success. Schmucker appears to me to have given a better account than any preceding military surgeon of the injuries of the thigh; and, from the results of his experience, he was led to believe, that though compound fractures of the lower part of the thigh-bone might, in favourable circumstances, be cured without amputation, yet that this operation is peculiarly necessary in all cases in which the fracture is si-

tuates in or above the middle of that bone. He had frequently performed amputation high in the thigh with success, but had never ventured to amputate at the hip-joint, though this was an operation upon which at an early period he seems to have bestowed great attention. The general results of Schmucker's observations, with regard to the practice of amputation, obtained in the Prussian armies from a continued attention to this subject during a period of nearly forty years, differ widely from those of his countryman Bilguer, of whose opinions and practice, the Essay of Schmucker may justly be regarded, though without being professedly such, as the ablest and most successful refutation which had then appeared.*

Amputation seems to have been less frequently performed by Schmucker's successors, Theden and Mursinna. The first of these authors has not, in his surgical writings, entered into any discussion with regard to the cases in which it is required, either immediately or remotely ;

* Untersuchung über die Abnehmung der Glieder von J. L. Schmucker. Vermischte Chirurgische Schriften, B. 1. Berlin, 1785.

but it would appear from the cases of injuries of the extremities which he relates, and from his remarks on the use of external remedies, that if he employed amputation at all, it must have been but seldom.*

Mursinna, who seems to have bestowed considerable attention upon this subject, states, that in the injuries of the extremities by fire-arms, he had generally been obliged to postpone cutting off the limbs till the day after the injury had been received, in order to obtain time to give to each case the requisite consideration. He appears to have performed amputation very seldom, unless in cases in which limbs had been shot off by cannon-balls, and even in these injuries he sometimes attempted to cure without this operation. When the thigh had been carried off near to its upper part, he conceived it to be useless and dangerous to amputate; and he had often attempted to save limbs in which the bones, as well as the soft parts, had been injured by cannon-balls. But of these cases, he confesses, that more had died

* Neue Bemerkungen und Erfahrungen, &c. Berlin 1782, 1795.

than had recovered, and that the treatment was painful, tedious, and full of danger. From this, and various other considerations, Mursinna seems at last to have been led to believe, that in the severer injuries of the extremities, it is more advantageous to amputate at an early period, than to subject the patient to the dangers and sufferings necessarily attendant upon the attempts to cure without amputation.*

Boy, who was chief surgeon to the French army of the Rhine, in some observations on the treatment of gun-shot wounds, which were ordered to be distributed in all the military hospitals in 1794, enters, at some length, into the consideration of the cases requiring amputation, and of the time most proper for performing it. His observations are the more valuable, that they appear to have been the result of accurate and extensive experience. Boy regarded amputation as indispensably required in wounds of the larger joints, and in a considerable proportion of the compound fractures of the extremities, particularly those of the thigh-bone.

* Neue Medicinisch-Chirurgische Beobachtungen Zweiter Theil. S 138. Berlin, 1796.

These are injuries, he remarks, which seldom ultimately recover without operation, even in those cases in which the surgeon, from the mildness of the symptoms, has been flattered with the hopes of effecting a cure, the patient almost always sinking at last under tedious and painful suppurations, hectic fever, and colliquative diarrhæa. Boy insists particularly on the advantages of amputating before the commencement of the inflammatory and constitutional symptoms. According to his experience, the operation, when performed upon the field, was almost always successful; but when delayed for a few days, it became either highly dangerous, or quite impracticable. He advises, therefore, that if amputation be not performed before inflammation supervenes, it should be postponed till the fever shall have abated after the commencement of suppuration. He had observed in many injuries of the knee, and in compound fractures of the thigh, when amputation had been deferred, that abscesses had extended up to the hip-joint and buttocks, producing a state in which recovery seldom, if ever, took place, and in which amputation was but a hopeless resource. In recommending imme-

mediate amputation, Boy points out two states of the body, during the continuance of which it should not be performed; the first, that state of nervous concussion, or tendency to sinking, of which he has given an excellent description, that occurs in gun-shot wounds, particularly when inflicted by cannon-balls; the second, that reduction of temperature which arises not only from the infliction of the wound, but also from exposure to external cold. Many, he remarks, had been observed to perish, whose limbs had been cut off while their bodies were stiff with cold; so that it became a rule with the French surgeons not to perform amputation, particularly during the winter season, till the natural heat had been completely restored. In urging the propriety of early amputation, Boy observes, that from the occurrence of these states, it is seldom, if ever, proper to operate till a short time shall have elapsed after an injury has been received. He allows that success from immediate amputation cannot be expected to be uniform, and maintains, that success, or want of success, may depend on circumstances over which the surgeon has no control; but he justly remarks, that the circumstances unfavourable to success, are not such as to render

vourable to amputation may be equally unfavourable to recovery, and produce likewise an increased mortality, from the wounds in which that operation is not performed. He acknowledges, that by following the practice which he recommends, some limbs may be cut off in which a cure might perhaps have been effected ; but he maintains that many lives will be preserved which would be lost by following a contrary practice, and that he had seen many die whom he was convinced might have been saved by early amputation.*

Baron Percy, in his *Manual of Military Surgery*, first published at Paris in the year 1794, a work eminently distinguished by the learning, good sense, and experience of the author, enters briefly into the consideration of some of the injuries of the extremities which require amputation ; and, in discussing this point, seems to hold a middle path between those who neglect the practice altogether, and those who employ it without discrimination of cases.† This author

* Wedekind's *Nachrichten über das Französische Kriegshospitalwesen*, Erster Band. S. 294. Leipzig, 1797.

† § V. *Des Plaies d'armes à feu aux extrémités.*

Quoique les plaies qui arrivent aux extrémités du corps soi-

appears to have adopted the opinions of Boucher with regard to the period at which it may

ent, toutes choses égales, moins dangereuses que celles qui arrivent aux différentes capacités, elles ont cependant leurs dangers, et deviennent souvent mortelles, si on n'a pas soin de les traiter d'une façon méthodique, et de prévenir par là des accidens qui causeroient la ruine de tout le corps. Ces plaies sont plus ou moins dangereuses à raison des parties où elles arrivent; telle plaie qui seroit simple vers le milieu d'un membre, est très-fâcheuse lorsqu'elle est arrivée à l'endroit de l'articulation. La texture spongieuse des os dans leurs extrémités, les aponévroses qui les recouvrent, les gros vaisseaux qui les avoisinent, les capsules ligamenteuses, les ligamens particuliers, les glandes synoviales qui sont dans l'intérieur des articulations, font assez sentir le danger de ces sortes de plaies, parce que ces parties susceptibles d'irritation, s'enflamment, sont attaquées de suppuration putride, d'où suit la fonte des graisses qui avoisinent l'articulation et en entretiennent la souplesse; et si le malade est assez heureux pour guérir, la contraction des ligamens, la roideur du membre, la difficulté du mouvement, même l'ankilose peuvent suivre la guérison.

Les plaies qui arrivent aux articulations ne sortent pas de la règle générale; lorsqu'elles n'en blessent point l'intérieur, elles doivent être traitées comme les autres plaies d'armes à feu, et exigent seulement un peu plus d'attention, à raison des accidens qui pourroient survenir. Si elles intéressent légèrement l'intérieur de l'articulation, après avoir débridé les parties, on applique des remèdes relâchans, et souvent on obtient la guérison, à cela près d'un peu de difficulté dans le mouvement. Les choses ne se passent pas aussi paisiblement, lorsqu'il y a fracas dans l'articulation, rupture des ligamens, contusion aux extrémités des os, destruction des épiphyses; pour lors on a tout à craindre de la lésion de ces parties, et les accidens qui com-

be most advantageously performed, recommending speedy amputation in those injuries of

mencent souvent avec beaucoup de violence, ne présentent d'autre parti à prendre que l'amputation.

Je sais que quelques observateurs fournissent des exemples de fracas aux articulations et aux extrémités, guéris sans l'amputation ; mais ces exemples séduisants pour des personnes peu versées dans la pratique, peuvent-ils établir une règle sûre et invariable ? Non, sans doute ; les praticiens éclairés seront toujours sur leurs gardes en pareil cas, et tenant une conduite différente de ceux qui proscrivent l'amputation, et de ceux qui la prodiguent sans nécessité, ils distingueront les cas où cette opération convient, et ceux où elle ne convient pas. Il est difficile de donner des préceptes capables de régler la conduite d'un jeune chirurgien en pareil cas ; il peut cependant diriger ses vues et se décider selon les accidens présens, et l'état du blessé ; par exemple, si un fracas à l'articulation arrive à un sujet fort et vigoureux, si les accidens sont violens, s'ils excitent des convulsions, des spasmes qui se transmettent à toute la machine ; s'ils se présentent ou se soutiennent malgré les incisions, l'extraction des corps étrangers, la dilatation des parties aponévrotiques, il n'y a point de doute qu'alors l'amputation, qui semble l'unique ressource, ne soit un moyen incertain ; d'où on doit conclure, en pareil cas, pour sa nécessité dans les premiers temps, et avant que les accidens paroissent. Il n'en est pas de même, si le sujet n'est pas vigoureux, et si les accidens semblent un peu céder aux premières opérations, les parties moins susceptibles de tension et d'irritation ne produiront pas des accidens aussi graves, et donnent alors lieu d'espérer quelque succès.

M. Boucher, dans ses Mémoires sur l'abus de l'amputation après les plaies d'armes à feu, présente aux jeunes chirurgiens quelques règles capables de les assurer dans les cas épineux,

the extremities in which we have reason to dread the supervention of violent inflammatory

et d'apprécier la conduite qu'il faut tenir dans les plaies compliquées, par rapport à l'amputation ; mais malgré ces recherches, la chose paroît encore problématique, et l'on ne peut être assez sur ses gardes, pour éviter l'excès, ou de ne jamais amputer, ou d'amputer trop souvent ; parce que si le succès de l'amputation n'est pas toujours heureux, celui des plaies compliquées ne l'est pas davantage, et que les blessés succombent souvent aux tentatives que l'on fait pour leur conserver un membre.

Pour guérir un fracas à une articulation, ou à une extrémité, il faut que le blessé puisse garder le repos, et avoir une situation avantageuse pour sa guérison : Or souvent on ne peut procurer ces avantages après les plaies d'armes à feu, parce qu'on est obligé de transporter les blessés d'un endroit à un autre ; ce qui empêche d'obtenir une guérison qui dépend essentiellement du repos et de la situation, et rend les tentatives que l'on avoit faites, non-seulement inutiles, mais même désavantageuses. Ce motif seul doit souvent déterminer les chirurgiens d'armée à l'amputation, et elle est d'autant mieux indiquée, que le délabrement des parties ne peut permettre que des espérances incertaines, et qu'en supposant même qu'on pût réussir, le transport des blessés après les batailles et pendant les sièges, y devient un obstacle insurmontable. Il faut observer que j'entends parler ici particulièrement des fracas aux articulations, et de ceux aux extrémités, dans lesquels les os détruits ne laissent plus aucun point d'appui aux parties molles.

Le peu de succès des amputations est sans doute une raison qui prévient contre cette opération : mais ce motif n'est pas fondé ; et il faut convenir que souvent le défaut du régime des blessés, leur constitution mauvaise ou viciée, l'air des hôpitaux, contribuent à leur perte. D'ailleurs, on doit établir des différences, selon les diverses espèces d'amputations : on sait que celles des membres considérables, tels que la cuisse ou le bras,

and constitutional symptoms; and, at the same time, advising delay till an abatement of the in-

surtout si on fait l'opération dans l'articulation de l'épaule, sont beaucoup plus fâcheuses que celles de la jambe, du bras et de l'avant-bras, parce que dans le premier cas, la portion du corps que l'on retranche étant considérable, la nature ne peut résister que difficilement; il n'en est pas de même dans les autres cas.

Il faut cependant convenir qu'on ne doit pas toujours précipiter l'amputation dans les plaies compliquées, lorsqu'on peut procurer au malade le repos et la situation convenables; il faut dans ce cas tenter les incisions, mettre les parties à l'aise, tirer les fragmens d'os, ou autres corps étrangers, réduire la partie autant qu'il est possible, et tâcher de prévenir les accidens; pour lors, si on voit qu'ils aient disposition à se développer, il sera assez temps d'en venir à l'amputation, qui sera alors d'autant plus heureuse, que les parties auront été auparavant dégorgées. Ces précautions réussissent souvent et dispensent de l'opération. P. 257.

Pour que le succès soit assuré, il est nécessaire que le boulet ou autre corps aient frappé dans une articulation large; car sans cela, l'ébranlement porté plus loin rendroit le mal plus étendu, et par cela même incurable. C'est par cette raison que l'on voit quelquefois guérir des extirpations dans les articulations, telles que celles de l'humérus, à l'occasion des plaies faites par le boulet; tandis qu'un os long, frappé dans sa partie moyenne par une balle seulement, cause souvent un tel ébranlement, que le mal est communiqué à l'articulation et même au-delà; d'où les praticiens ont sagement conclu qu'il étoit avantageux et même nécessaire de faire l'amputation dans la partie audessus du membre frappé, lorsqu'elle est indiquée après des coups violens.

C'est à raison de cet ébranlement, que l'on peut concevoir comment arrive la stupeur; pourquoi un membre simplement

flammatory and constitutional symptoms shall have taken place in those instances in which an attempt had been made to save the injured limbs. He remarks, that the circumstances in which a wounded soldier is frequently placed, render the attempt at cure not only useless, but dangerous, and make it often necessary for the military surgeon to perform immediate amputation in cases in which he ought to have attempted to preserve the limb, could he have procured for his patient rest, proper situation, and other favourable circumstances.

In his extemporaneous answers to a series of questions proposed by the Commission of

contus par un boulet, produit souvent des accidens mortels; pourquoi il jette les parties dans l'affaïssement, suffoque et anéantit le principe vital au point de détruire les fonctions. Tel étoit le cas du cheveu-léger dont parle M. Quesnay, qui, frappé à la jambe par l'éclat d'une boîte, devint aussitôt insensible à son état, supporta l'amputation d'une façon indifférente, et resta également tranquille jusqu'à la mort.

Je crois devoir finir en faisant remarquer que certaines plaies des extrémités, légères en apparence, sont souvent très dangereuses, quoique des plaies plus considérables par le fracas guérissent aisément; ce qui doit rendre très-circonspect sur le pronostic, et exiger de la part du chirurgien des attentions pour prévenir ou dissiper les accidens qui pourroient résulter quelquefois d'une simple contusion, ou de toute autre blessure qui paroîtroit mériter peu de considération. *Manuel du Chirurgien d'Armée*, p. 271. A Paris, 1792.

Health in the year 1794, when he was chief surgeon to the army of the Moselle, Percy has given an additional explanation of his opinions with regard to the cases in which amputation is more immediately or remotely required, and also with regard to the comparative advantages or disadvantages of these two methods of treatment. It is impossible, I conceive, after the enumeration which he has given of the cases in which it is proper or necessary to perform immediate amputation, not to consider this author as one of the most intelligent and able defenders of this practice. He regards the compound fractures of the thigh-bone as very dangerous accidents; but he does not appear to have been fully aware at the time his answers were given, of the advantages which may be derived from the employment of early amputation in these injuries. More recent experience has shewn, as Schmucker had previously pointed out, that the greater number of the dangerous, or fatal consequences, resulting from these injuries, may, in a great measure, be prevented by the timely use of the knife.*

* *D.* Déterminer les cas où les corps poussés par la poudre à canon, nécessitent l'amputation à l'instant ?

Mr Hunter, in the few remarks which he has left us on the subject of gun-shot wounds,

R. Cette question fourniroit-elle seule la matière d'un grand ouvrage. La ci-devant académie de chirurgie, après plusieurs années de débats, l'a laissée dans l'indécision. Les mémoires de *Bilguer*, *Boucher*, *Faure*, *Lamartinière*, *Bordenave*, *Ba-gieux*, etc. n'ont servi qu'à la rendre plus problématique; je puis donc à peine l'effleurer ici. La commission de santé, si jamais elle ose aborder un sujet si difficile, verra qu'il est bien plus aisé de le proposer que de le discuter, et s'assurera qu'en quelques heures, il n'est possible de tracer autre chose que des généralités.

Lorsqu'un membre frappé par un éclat de bombe, d'obus, ou par un gros biscayen, en a été tellement maltraité, que les os en sont domminués, les muscles, les nerfs, les vaisseaux dilacérés, il y auroit de la témérité à chercher à le conserver, surtout, si le désordre, que je suppose extrême, est voisin d'une grande articulation. La saine chirurgie prescrit de le retrancher soudain.

Dans les coups de feu, avec une perte de substance très-considérable du cylindre des os et du corps des muscles, quoiqu'une ou deux artères existent encore dans leur intégrité, il ne faut pas balancer à faire le sacrifice de l'extrémité réduite à un si fâcheux état, et le plutôt sera le meilleur.

La lacération d'un gros tronc d'artère dont la ligature, quand même elle seroit praticable, entraîneroit inévitablement la perte du membre, impose également l'obligation d'amputer sans retard.

Un boulet, à la fin de sa course, a converti en une espèce de putrilage, les os, les muscles, etc. sans solution de continuité à la peau. La partie se tuméfie subitement; l'engorgement, en peu d'instans, devient excessif; les accidens arrivent en foule. J'ai reconnu, dans ce cas, heureusement rare, l'insuffisance des

seems to consider it as doubtful whether there be any cases of injuries of the extremities, with

incisions, et observé que l'amputation devoit être aussi prompte, qu'elle est indispensable.

L'expérience m'a également appris, que de cent coups de feu, aux genoux, avec fracas des os, rupture des ligamens, déchirement des trames capsulaires, quatre-vingt-dix-neuf étoient mortels, si on ne recouroit de bonne heure à l'amputation. Il n'en est pas de même de ceux aux autres articulations, quoique très périlleux, et nécessitant souvent cette malheureuse ressource.

Un membre a-t-il été emporté en entier par un boulet ? Il faut, sur-le-champ, enlever les chairs contuses, dilacérées et pendantes en lambeaux ; faire la résection de la portion d'os excédente, et lier les vaisseaux : ce qui peut s'appeler *amputer sur les restes d'un membre*. Mais si la séparation opérée par le boulet est trop voisine d'un article ; si, par exemple, la jambe a été emportée quelques pouces audessous du genou, on ne peut sauver le blessé qu'en amputant la cuisse audessus de cette articulation, où n'ont pas manqué de s'étendre les ravages du coup ; et il ne faut pas moins, dans ce cas, se presser, que dans le précédent.

D. Parler de ceux où il faut temporiser ?

R. Le Dran a conseillé d'amputer d'abord, lorsqu'une balle fixée dans un os n'a pu en être extraite ; mais les praticiens ont rejeté cette dangereuse précipitation ; et en admettant même l'impossibilité d'une exérese pour laquelle il existe tant de moyens efficaces, il s'en faut bien qu'une telle complication de cause doive être un motif déterminant pour une opération de si grande importance.

Autrefois on amputoit d'emblée la jambe, ou l'avant bras, dans la plupart des coups de feu aux pieds, ou aux mains, avec brisement des os, et déchirement des tendons. La chirurgie

the exception of the wound of a considerable blood-vessel, and an almost complete separa-

moderne a encore reprouvé cette pratique meurtrière ; et ce n'est que lorsque le succès n'a point couronné les efforts qu'elle a faits pour conserver, qu'elle admet la triste nécessité de détruire.

Le résultat de mes nombreuses observations sur les coups de feu à la cuisse, avec fracture de l'os, est, qu'à peine, sur dix blessés, il en réchappe deux, tant les énormes incisions qu'il faut faire, les longues et abondantes suppurations, la carie, les dévoiemens purulens, la tabidité, etc. multiplient les périls de ces blessures. Cependant il seroit bien condamnable, le chirurgien qui débuteroit par retrancher une extrémité, en faveur de laquelle on peut compter quelques chances heureuses. L'amputation doit être un *ultimatum* que l'habitude difficile du pronostic, a seule le droit d'avancer ou de retarder.

Lorsque le frisson, la stupeur, l'apathie où un coup de feu plonge quelquefois les blessés, sont portés un peu loin ; malgré la gravité de la blessure qui indique l'amputation, il ne faudra la pratiquer que quand le sentiment se sera éveillé et la chaleur rétablie ; sans quoi on s'exposeroit à voir bientôt le moignon tomber en gangrène.

Une hémorrhagie menaçante seroit le seul cas d'urgence qui pourroit faire déroger à ce principe.

L'adulte vigoureux, sanguin, irritable, résiste plus difficilement à une amputation, qu'un individu foible et d'un tempérament phlegmatique. Quand on peut, sans danger, attendre que la diète, les saignées, les boissons, aient abbatu cet excès de force dont on a tout à craindre dans les premiers momens, il faut retarder l'opération ; mais ce délai, s'il n'est judicieusement calculé par un homme sage et habile, peut coûter la vie à bien des blessés, pour quelques-uns qu'il aura contribué à sauver.

tion of a limb, in which immediate amputation ought to be performed. He regards a state of

Au reste, on est malheureusement forcé, à l'armée, dans plus d'une circonstance, de couper un membre que le repos, une bonne situation, et la réunion de tous les avantages qu'on rencontre dans un hôpital, eussent peut-être réussi à conserver. Mais l'obligation de transporter les blessés d'un endroit à un autre, après les batailles et les sièges : la longueur et la difficulté des routes, et une foule d'autres obstacles également contraires et fâcheux, nécessitent une mutilation à laquelle sont attachés des dangers moins redoutables que ceux qu'occasionneroient des plaies avec un grand délabrement, tant dans les os, que dans les chairs, si elles étoient sans cesse irritées par les secousses des voitures et la placement et déplacement continuels des blessés.

Bilguer et *Tissot* son traducteur, ne vouloient pas qu'on fit jamais d'amputation. *Faure* a été l'apôtre des amputations tardives. *Boucher*, *Bagieu*, *Ledran*, *Desport*, etc. ont penché pour les amputations hâtives. Mais ces auteurs, guidés les uns par le préjugé, les autres par la passion, ont été, ou déçus, ou décevans. Aucun des faits sur lesquels ils ont basé leur doctrine, n'est peremptoire ; et si, en Prusse, où l'amputation fut si longtemps frappée de proscription, le vieux *Theßen*, *Schmucker*, *Koëts*, et *Bilguer*, lui-même, sont forcés chaque jour d'y recourir : la chirurgie françoise, malgré les mémoires publiés contradictoirement sur ce sujet si intéressant pour l'humanité, flotte encore incertaine entre deux partis qui ont eu chacun des défenseurs imposans.

D. Faire le récit des inconvéniens attachés à l'un et à l'autre procédé ?

R. La surabondance des forces, l'état de pléthore, les dispositions inflammatoires, l'irritation du système nerveux, l'état violent de l'âme, ouvrent, chez certains blessés qu'on ampute

health and vigour as unfavourable to the operation, and conceives immediate amputation, in

extemplo, une source d'accidens capables de ruiner les plus belles espérances. Chez d'autres, l'abattement moral, la prostration des forces, la saburre des premières voies, l'état cachectique des liqueurs, la maigreur de tout le corps, donneroient naissance à une foule d'événemens fâcheux, si on ne remettoit l'opération à un autre temps.

Il faut chez les premiers, autant qu'il est possible, calmer l'exaspération des nerfs ; réduire les forces vitales à un degré convenable ; rétablir l'ordre dans l'économie animale ; inspirer la confiance et la sécurité, et n'opérer qu'après avoir assuré ces dispositions favorables.

Chez les autres, il est essentiel de relever préalablement les forces et le courage ; de recourir aux évacuations ; de corriger jusqu'à un certain point le vice des humeurs, et de mettre la fibre en état de produire ces oscillations vivifiantes, cette réaction salutaire, sans lesquelles il n'y a point de succès à espérer.

C'est ainsi qu'à réussi *Faure*, à l'hôpital de Douay, sur dix blessés qu'il n'opéra, les uns qu'après vingt-neuf jours, et les autres qu'après quarante ; les ayant sauvés, sur un grand nombre, sans doute, de l'écueil des accidens primitifs.

Il n'est pas inutile de dire ici, que l'amputation, à laquelle nous n'avons jamais eu recours qu'à regret, et forcés par les plus impérieuses circonstances, a été singulièrement heureuse dans cette armée. De vingt-huit amputés, à l'affaire de la Lune, vingt-trois sont vivans ; de treize à Wavren et Bérich, dix se portent bien ; de quarante-un à Kaysers-Lauter, trente-cinq sont existans ; de douze à Saint-Imbert et Sarrebruck, neuf jouissent à présent de la reconnoissance nationale ; de dix-neuf à Limbach, quinze sont dans le même cas ; et de quinze à Tripstatt, quatorze ont été vus et félicités sur leur

wounds of the extremities, to be a second injury superadded to, and increasing the danger of, the first; he therefore maintains, that in the cases in which death would ensue from the inflammation excited by the injury, no advantage is to be expected from amputation, while, in the cases which admit of being brought through the first inflammation, the operation will always be more successful after the abatement, than before the commencement, of that state. In stating these opinions, Mr Hunter has taken no notice of the obstacles which arise to the performance of secondary amputation; and, contrary to his usual method, has made no reference to his own experience. It seems strange that he should have conceived it to be universally allowed, by those whom we are to esteem the best judges, that the greater success of late than early amputation had been established by

guérison, par le commandant en chef de l'armée, à son dernier passage à Bitche, avec un représentant du peuple.

Les autres opérations plus difficiles et plus nombreuses qui y ont été pratiquées, et qui s'y font chaque jour, ne prouvent pas moins favorablement pour les méthodes que nous avons adoptées, et pour celles que nous avons nous mêmes imaginées. *Responses du Citoyen Percy aux Questions Epuratoires qui lui ont été proposées par la Commission de Santé Séante à Paris, Pyrotechnie Chirurgicale-Pratique. A Paris, 1810. App. p. 14.*

the results of comparative observation. Faure is, I believe, the only military surgeon who has pretended to have instituted a comparison of the kind to which Mr Hunter alludes.*

Mr John Bell, in his *Discourses on Wounds*, published in 1798, a work which has had considerable influence on the opinions and practice of the army and navy surgeons of this country, has combated, with great spirit, the doctrines of Bilguer with regard to amputation, and has shewn how defective, in every particular, the evidence is which Bilguer has adduced in support of these doctrines. Mr Bell recommends that amputation be immediately performed in all cases requiring that operation; and, in pointing out the dangers which arise from delay, he insists particularly on the impropriety of performing amputation in the second period during the continuance of the febrile and inflammatory state. He endeavours to prove, that much of the want of success which had attended the practice of the French and Prussian surgeons, had proceeded from the

* *Treatise on the Blood, Inflammation, and Gun-shot Wounds*, p. 559. Lond. 1794.

operation having been performed at an improper time, in an imperfect manner, or in circumstances unfavourable to recovery; and he supports this opinion by a reference to their writings. Mr Bell's enumeration of the cases requiring amputation does not differ very materially from that given by Faure. He has not made any mention of the injuries of the shoulder or hip-joint, nor, of course, of the conduct to be pursued by the surgeon in the treatment of these accidents.*

Of the few military surgeons who have adopted the doctrines of Bilguer with regard to amputation, no one appears to have done so more closely than M. Mehee. This author published, so lately as the year 1799, a Treatise upon Gun-shot Wounds, in which he endeavours to demonstrate that amputation is never required in wounds made by musket-bullets, and but very seldom in those inflicted by cannon-balls. These very extravagant positions he endeavours to establish chiefly by a reference to the cases of cures of injuries of the

* Discourses on the Nature and Cure of Wounds. Third edition. Edinburgh, 1812.

extremities related by Boucher, Faure, Desportes, Ravaton, and Bilguer, and to a few which had occurred to his own observation. He admits of one case only in which amputation ought to be performed, namely, gangrene succeeding to a wound made by a cannon-shot, and maintains, that in every case of this kind the amputation ought to be performed on the appearance of the gangrene, in order to prevent it from extending up the limb. But in recommending this practice so strenuously, Mehee has adduced no examples of its usefulness, either from his own observation or from that of others. In gangrene, again, arising from an internal cause, Mehee maintains that the operation should be delayed till the gangrene has stopped, and a line of separation has formed between the living and dead parts.*

M. Lombard, professor of surgery at the military hospital at Strasbourg, in a treatise upon gun-shot wounds, published at Lyons in 1804, admits that there are a considerable number of injuries of the extremities in which amputation is immediately required, and in which it may

* *Traité des Plaies d'armes à feu*, à Paris, An. 8. .

prevent the occurrence of future evil; yet he seems to regard that operation as less frequently necessary than had been often imagined, and as one, which, in doubtful cases, may be performed more advantageously at a late than at an early period of the injury. This author affirms, that, in a variety of cases, he had observed early amputation to be less successful than that which was performed at a late period; but he has given us no information by which we can judge of the precise period, or circumstances, in which, in the unsuccessful cases, the amputation had been performed. It is remarkable that this author should have excepted from the class of injuries requiring immediate amputation, those in which limbs had been carried off by cannon-balls, but it would require many more cases than are given by Lombard, and much more accurate statements, to justify an opinion and practice differing so widely from those of almost all other military surgeons.*

During the long and bloody wars in which Europe has lately been engaged, great and im-

* Clinique Chirurgicale des plaies faites par armes à feu. A Lyon, 1804.

portant advances have been made in our knowledge of military surgery, particularly in that branch of it which relates to amputation. Among the different individuals who have contributed to the improvement of this branch of military surgery, Baron Larrey undoubtedly holds the first place. This celebrated surgeon has, with singular activity and zeal, availed himself of the unequalled opportunities afforded by the numerous campaigns of the French armies, to observe and record the local and constitutional effects which are produced in the body by external violence, under all the various circumstances in which these armies have been placed. No part of this author's observations and writings appears to me to be more original, or valuable, than that which relates to the subject of amputation. He has proved, in a most satisfactory manner, the superior advantages of immediate operation, and has taught surgeons the practicability and safety of removing the inferior, as well as the superior, extremity in the articulation which connects it with the trunk of the body. The enumeration which M. Larrey has given of the cases in which amputation may be required, either immediately or remote-

ly, is sufficient to shew, that though in general his mind was impressed with the great benefits to be derived from that operation, he is by no means an advocate for its indiscriminate use.*

Graefe, professor of military surgery at Berlin, in his work, entitled, *Rules for the Performance of Amputation*, states, that he had observed that the French surgeons, who amputated on the field all the more severe gun-shot fractures of the extremities, saved the lives of a far greater number of those who had received these injuries, than the more circumspect German surgeons, who delayed the operation till that period had passed over in which it could have been of use. He lays it down as a rule, that amputation is necessary in every case in which there is reason to believe that the injury is incurable, and the life in danger; and, also, that this operation should be performed before the usual evil consequences of the wound supervene. When the amputation is delayed till these consequences develop themselves, it can only hasten on, he conceives, a death become

* *Memoires de Chirurgie Militaire.* A Paris, 1812.

inevitable. He concurs in opinion with those military surgeons who believe that the circumstances accompanying war, often render injuries of the extremities dangerous, or fatal, which are not necessarily so in themselves, and that this danger may, in a great measure, be prevented by immediate amputation. This operation he also considers as necessary in wounds which are more difficult to heal than those made by amputation, and which would leave behind them a limb less useful than an artificial one; and he justly remarks, that this rule is more applicable to wounds of the lower than to those of the upper extremities.*

The propriety and advantages of immediate amputation have been amply illustrated and fully confirmed, in a treatise on gun-shot wounds, lately published in this country by Mr Guthrie, deputy-inspector of military hospitals. Besides the observations peculiar to the author, this work, which is the fruit of much practical experience, contains an account of the general opinions and practice of the British surgeons:

* Normen für die Ablösung Grösserer Gliedmassen, Berlin, 1812.

during the late war in the Peninsula, and official returns of results of operations much more minute, accurate, and useful, than any to be found on the records of military surgery. The very flattering approbation with which this publication has been received, and the high estimation in which it is held by army-surgeons, will induce the author, it is hoped, to publish, in the same useful and practical manner, his observations and researches in the other branches of military surgery; and, at the same time, tend to encourage the naval and military surgeons of this country to communicate to the public the results of their observation and experience.*

It is surely much to be regretted, that notwithstanding the numerous wars in which Britain has been engaged in all parts of the world, and the number of well-educated, intelligent, and active medical officers who have been employed in these wars, the greater part of the knowledge acquired, has hitherto been allowed to remain, and even to perish, with its possessors. The value of the information contained

* On Gun-shot Wounds of the Extremities, requiring the different Operations of Amputation. Lond. 1815.

in the results of the few official details of the diseases of the navy and army, which have been published during the last war, must increase this regret, and make us sensible how much the general stock of medical knowledge might have been augmented, had those enjoying similar opportunities with the authors of these collections been animated with an equal zeal for the improvement of their profession.

From this historical review, it is evident that the cases of injury which require amputation, and the period in which it may be most advantageously performed, are points which have been the subjects of much discussion among medical men, and that great progress has been already made in their investigation. It appears also that all military surgeons have allowed that there are certain injuries of the extremities in which amputation is required; that most of them have been of opinion that in these injuries it is more advantageous to amputate immediately, or soon after they have been received, than to delay the operation; and that those who have contended for delay, have, in general, agreed in regarding it as extremely dangerous to operate during the existence of high degrees of inflammation and fever.

The evidence in favour of the advantages of immediate amputation, appears to me to have always preponderated over that for delay; but this preponderance has of late been evinced in the clearest and most satisfactory manner by the results obtained in the practice of the French and English military surgeons. A careful examination of the few statements which have been given in proof of the advantages supposed to arise from delayed amputation, cannot fail, I conceive, to convince every impartial enquirer that these statements have had their origin in inaccurate observation, and in an imperfect view of the subject to which they relate. None of those who have made them, seem to have been sufficiently aware of the great difference which exists between the results of amputation performed before the commencement of inflammation and fever, and those which occur from amputation performed after the supervention of these states. Accordingly, the greater part of the objections which have been stated to immediate amputation, appears to have been founded on the unsuccessful results of operations performed upon the second, third, fourth, and even fifth day of an injury, at a period

when inflammation and fever must necessarily have commenced. It is this inaccuracy of observation also which seems to have given rise to the opinion so often maintained, that a state of health and vigour is a state unfavourable to amputation ; an opinion which has been amply refuted by the late experience of army surgeons, and the truth of which indeed had been previously disproved by the very great success which, in most situations, has been known to attend the long-established practice of immediate amputation in the British navy.

In the actions of the 16th and 18th of June, amputation had been performed upon the field in a number of instances, both by the French and English surgeons. In many cases, however, this operation had been deferred partly from necessity, and partly from the hope that a cure might be effected without the loss of the injured limbs. Of the more severe of these cases, a number had died of symptomatic fever ; a large proportion, after the abatement of this state, had suffered amputation ; and a considerable number, as I have already had frequent occasion to state, remained in circumstances in which that operation would have been either

highly dangerous, or was wholly inadmissible. Even of those appearing to recover, it seemed to me that many might have been benefited by early amputation ; in several, the limbs which had been preserved would be useless or troublesome ; and in others, the pain and suffering occasioned by the injury would, in all probability, oblige the patient to have recourse to that operation at some future period.

The result of the amputations performed in Belgium might, on the whole, be said to be successful, though it certainly was not equally so with that which is stated by M. Larrey and Mr Guthrie to have been obtained in some other countries ; and, what is curious, this comparative want of success was more remarkable in the results of the primary than of the secondary amputations. This must, in part, be attributed, I conceive, to the influence of climate, and to the dangerous nature of the symptomatic fever which is excited by wounds and operations in that country. But nothing can evince in a more satisfactory manner the present improved state of surgery, and the attention which must have been given by the British surgeons to the circumstances upon which the fa-

vourable result of amputation depends, than the great success which attended the operation, when compared with that recorded to have been obtained from it at any former period in Belgium.

The cases of amputation amounted to nearly 500 ; and in more than one-third of these the operation had been performed before the super-vention of inflammation and fever. The number of those in whom amputation was delayed, who died before it could be performed, the protracted pain, suffering, and danger of those in whom that operation became ultimately necessary and practicable, and the far greater proportion even of these who died, than of those who had undergone amputation at an early period, were circumstances so evident and striking, as to occasion many regrets among the army surgeons that primary amputation had not been more frequently performed.

The presence in the field of a numerous medical staff, well instructed with regard to the cases which require amputation, and provided with every convenience possible for bringing the wounded speedily under their inspection, is indispensably necessary to secure the advantages

which it is now universally acknowledged may be derived from early amputation. The hurry, confusion, and uncertainty which occur during a battle, the multiplicity and variety of the cases which demand attention, and the shortness of the time which is left for deliberation in the period which intervenes between the infliction of a wound and the occurrence of inflammation and fever, all render it extremely desirable and proper that the military surgeon should be guided in his conduct by general rules, easily remembered, and readily applicable to the cases in which his assistance may be required. Without some such aids, he must be in danger of being delayed and misled in his determinations by the entreaties of the wounded, by the misgivings of his own mind, and by that diversity of opinion which is so liable to arise among those who are called upon to deliberate in consultation, and thus suffer much of that period to pass over, upon his prompt and judicious decisions during which the lives of so many of the wounded may depend. The following reflections of M. Quesnai on the necessity of amputation in severe cases of contusion, may be extended, I conceive, with the greatest propriety,

to every case in which that operation is required.

“ Mais quand la contusion est si profonde, que les chairs et les os se trouvent excessivement brisés dans toute l'épaisseur de la partie, on ne peut point, dans ce cas, espérer de dissiper l'engorgement : L'amputation est alors le seul remède qu'on puisse employer sûrement pour prévenir la gangrene et ses suites ; mais dans ces cas, il est souvent difficile de se décider sur la nécessité indispensable de l'amputation. On a souvent vû des fractures avec grand fracas d'os, grande contusion, grand déchirement dans les chairs, où l'on a évité avec succès cette opération ; mais souvent aussi on s'est repenti de ne l'avoir pas faite au plutôt ; car en très-peu de tems, les dispositions à la mortification se déclarent et s'étendent dans toute la partie, avec un progrès si rapide, qu'on ne peut plus recourir avec confiance à l'amputation : Il n'y a donc dans ce dernier cas, qu'un instant pour se décider, et dans ce tems qui est le premier moment de la maladie, des expériences opposées vous jettent dans la perplexité ; vous craignez de retrancher un membre que vous pourriez peut-être conserver ; mais vous craignez encore plus pour la vie du malade, que vous risquez en voulant

éviter l'opération ; ainsi, lorsque le désordre est fort considérable dans les os et dans les chairs, on doit dans un cas si pressant, prendre le parti le plus sûr pour la vie du malade. Il n'est pas douteux, qu'en suivant régulièrement ce précepte, on ampute beaucoup de membres qui auroient pû être guéris ; mais les Praticiens se conduisent toujours avec sagesse et avec humanité, lorsqu'après avoir bien tout examiné et tout pésé, ils discernent et suivent l'indication la plus sûre, quoiqu'elle exclue des avantages que l'on pourroit quelquefois obtenir par la témérité."

"When a judicious man says that a limb ought to be removed, it is not," Mr Pott observes, "to be supposed that he means to say, that it is absolutely impossible, at all events, that such limb can be saved, nor that such patient must infallibly die, if the operation be not performed ; no, he only means that from repeated experience of himself, and others, in all times it has been found that the circumstances above-mentioned put the patient's life much more to hazard in an attempt to save the limb, than the operation does in removing it ; and therefore that humanity as well as judgment determine for the latter. On the other hand, it must

be allowed, that from some of the worst of these cases, some have had the good fortune to escape ; but escapes they so truly are, that I make no scruple to affirm, that in certain cases and circumstances, a determination not to amputate, is a determination much more unfavourable and hazardous to the patient, than that for amputation can be." It is not enough for the military surgeon that the wounded do not die in consequence of operations in which he has been actively engaged ; his conscience must be satisfied that the dangerous or fatal symptoms which supervene in wounds in which operation has not been performed, could not have been prevented by the use of the means which he may have neglected to employ for the relief and recovery of his patients. Without this conviction, his duty must have been but imperfectly performed, and he can never attain that noble satisfaction of mind which springs from the consciousness of having contributed to the safety and welfare of those whose lives have been entrusted to his care.

It has been very generally admitted by military surgeons, that immediate amputation is required in almost all the injuries of the extremi-

ties occasioned by cannon-shot, and also in many of those inflicted by musket-bullets. In particular, this operation has been deemed indispensable,

I. Where a limb has been shot off.

II. Where the bones or joints have been fractured, or much bruised by cannon-balls.

III. Where large portions of the soft parts have been removed with the division of the principal blood-vessels and nerves, or with the denudation and contusion of bone.

IV. Where, without the division of the skin, the bones have been fractured by the impulse of a spent ball, and the soft parts severely contused and disorganized.

V. Where the division of the principal artery of a limb, accompanied by fracture of the bone, has been produced by a musket-bullet; and,

VI. Where musket-bullets, in passing through the large joints, have not only torn and lacerated the ligaments, but have also fractured the articulating surfaces of the bones.

Speedy death from hemorrhage, gangrene, or symptomatic fever, is the usual consequence of the first five kinds of injury; and, accordingly,

Dr Somerville and I found few examples of such cases surviving in which early amputation had not been performed. Injuries of the sixth kind do not, in general, prove so speedily fatal; but, without immediate amputation, a small proportion only can be expected ultimately to recover. In Belgium, some of those who had suffered this injury died during the first attack of inflammation and fever; we saw some sinking more slowly under hectic fever and diarrhæa, and of the remainder a great proportion had passed, or were passing, into a state in which secondary amputation affords the only chance of recovery.

Besides these six classes, various kinds of wounds occur, in many of which, if amputation be not performed immediately, dangerous degrees of inflammation and fever supervene, and in those who survive, the operation becomes necessary at a subsequent period. In many of these, there is reason to believe, that immediate amputation would be advantageous from the greater number of lives that might be preserved by it; but, in the present state of our knowledge, it is difficult, if not impossible, to define accurately all the cases in which this

practice ought to be followed. In judging of the propriety of immediate amputation, the surgeon must be guided by attention to the place of the wound, to the number, nature, and extent of the parts that have been injured, and by his knowledge of the effects which these sorts of injuries are liable to produce, and of the circumstances more or less favourable to recovery without amputation in which the wounded must be placed. A short enumeration of the different injuries of the extremities which require immediate amputation, founded partly on our observation in Belgium, and partly on the accounts which have been given of these injuries by practical authors, will probably place this subject in a clearer point of view than any general statements or reasonings into which I could enter.

Gun-shot wounds of the fingers and toes, with injury of the bones, generally require amputation on account of their backwardness to heal, and of the inconvenience and deformity which they occasion. These wounds are liable, in particular constitutions, to be followed by great local inflammation, and by tetanus. In wounds of the joints at the roots of the thumb

and great toe, as in the compound dislocations of these parts, the inflammation which occurs has often a gangrenous tendency. There is every reason to think that this may, in a great measure, be prevented by early amputation; but it is still, I believe, to be ascertained, whether tetanus may be prevented by the same means.

The wounds of the metacarpus and metatarsus, produced by musket-bullets, do not appear to require immediate amputation, unless in those instances in which the bullets have passed in a transverse direction through several of the bones, and have, at the same time, injured severely the surrounding soft parts. Great advantage, however, may often be derived in the treatment of these wounds by early dilatation, and by the extraction of the loose and splintered fragments of bone. In injuries of the metatarsus so severe as to require amputation, the posterior part of the foot may, in general, be preserved, provided the operation be performed immediately; if delayed, the inflammation which extends from the wound, and the abscesses which are liable to form, render the removal of the whole foot necessary.

Wounds of the carpus by musket-bullets seldom require immediate amputation ; but this operation is not unfrequently necessary and proper in those of the tarsus. Bullets in entering the tarsus are sometimes lodged in the bones, and undergo an alteration of form, which makes their extraction difficult if not impossible. In cases in which this has happened, and in cases in which balls in passing through have fractured the astragalus near to the ankle-joint, high and sometimes dangerous degrees of inflammation and fever are excited, which are succeeded by fistulous abscesses, connected with caries, death, and exfoliation of bone.

The hemorrhage with which the wounds of the hand and foot are frequently accompanied, is seldom a sufficient reason for amputation, because, in most cases, it may be suppressed even when a ligature cannot be used, by the application of pieces of sponge and moderate pressure by bandaging. As the wounds of the hand and foot seldom prove fatal, unless from occasional attacks of gangrenous inflammation and tetanus, and as, in these injuries, the difference in success, between primary and secondary amputation, is not very considerable, the operation at

both periods being in general performed in sound parts, it may be delayed, in the urgency of more important cases, without much danger to the patient.

Wounds of the wrist-joint, in which the articulating surfaces of the bones, particularly of the radius, are severely fractured, require, in general, immediate amputation, for they seldom heal without its being necessary, sooner or later, to remove the injured part. We saw several instances in which great swelling, with fungous granulations, had succeeded to injuries of this kind, and in which much pain and suffering might have been saved by early amputation. The slighter injuries of the wrist-joint frequently heal without amputation ; and it would seem that in the wounds of this part, the operation may be delayed without much danger to the lives of the patients.

Wounds in which musket-bullets have passed through, or are lodged in the ankle-joint, almost all require immediate amputation. These injuries, by giving rise to high degrees of inflammation and symptomatic fever, not unfrequently prove fatal. Among a great number who had survived the fever, we saw but few in

whom secondary amputation was not required ; and, in the cases requiring it, this operation was far from being so successful as the primary amputation had been. In the slighter wounds of the ankle-joint, in which the external parts only have been injured, amputation may be delayed with some prospect of recovery by anchylosis, provided the patient can be placed in favourable circumstances, and the limb kept for a long time without using it, in a horizontal position.

Wounds of the fore-arm by musket-balls very seldom require immediate amputation. This operation, however, might, I conceive, be necessary in a case in which both bones had been fractured by the bullet, and the radial and ulnar arteries at the same time divided. We saw several cases of fractured fore-arms in which amputation became necessary, on account of secondary hemorrhage, of mortification, and, in particular constitutions, on account of want of reunion in the fractured bones.

It has always been acknowledged to be extremely difficult to lay down fixed or precise rules with regard to immediate amputation in the injuries of the legs occasioned by musket-

bullets. That operation, however, I am convinced, is proper in military practice; 1st, In cases in which both bones of the leg have been broken; 2d, In cases in which the bullets have passed through the ends of the tibia, and have fractured this bone near to the knee or ankle-joints; 3d, In cases in which a bullet is lodged deep in the tibia; and, 4thly, In fractures of the tibia, with wounds of the arteries in the leg. It may be doubted whether the practice of immediate amputation would be proper or necessary in all these cases, could the wounded be conveyed directly into convenient hospitals in which they might remain during the period necessary for their recovery; for we have no data by which it is possible for us to judge very accurately what proportion of them would recover without amputation, how many would require amputation at a late period, and of those in which recovery should take place, in what proportion the limbs would be useful, or remain useless and troublesome. In these injuries, death is not unfrequently the consequence of the symptomatic fever; and it will be seen, from the short account of them which I have already given, that, in Belgium, where the wound-

ed were placed in circumstances uncommonly favourable, many required secondary amputation, an operation in injuries of the leg much more dangerous than the primary ; that from the extension of inflammation, it became frequently necessary to remove the limb above the knee in cases in which it might at first have been taken off below that joint ; and that, in other cases, where amputation remained the only resource, it had become impossible to perform it on account of the inflammation and swelling which had extended up the thigh. By a more general adoption of early amputation in the gun-shot fractures of the legs, some limbs would undoubtedly be removed which might be preserved ; but much suffering would certainly be prevented, and I am inclined to believe, that many lives would be saved, which, without that operation, must necessarily be lost. It is superfluous to insist on the great advantages which would result from the practice of immediate amputation in the situations in which the wounded soldier is unavoidably but too frequently placed ; he can seldom be treated on the spot where he has received his injury, but must be subjected to the pain and danger arising from the motion of the waggons during his

frequently long and tedious conveyance to a place of safety, and afterwards must often be placed in inconvenient and ill-provided hospitals; or, in the event of defeat, or of sudden retreat, must sometimes be abandoned altogether to the care of the enemy.

Wounds of the elbow-joint, in which the bullets pass through that joint and fracture the articulating surfaces of the bones, require immediate amputation. The same rule may be applied, I believe, to those sabre-wounds by which the articulating surfaces of the bones of this joint are severely injured. Superficial gun-shot wounds, and slight sabre-wounds, frequently heal without amputation being required; though, even in these, the constitutional symptoms are in general severe, and secondary amputation may become necessary. In cases of wounds of the elbow-joint, in which there may be reason to expect a cure, delay is more admissible than in the wounds of the knee-joint, as well on account of the less dangerous nature of those wounds, as of the difference between the success of primary and secondary amputation being much less in the arm than in the thigh. Whether, in the practice of civil life, much benefit shall ever be derived from the excision of

the ends of the bones in the injuries of the elbow-joint, must be left to future experience to determine. I am satisfied that the difficulty of the operation, and the great length of time and care necessary for the cure, must prevent its adoption in military practice.

Immediate amputation has generally been acknowledged to be particularly necessary in wounds in which bullets have passed through the knee-joints, and have fractured the articulating surfaces of the bones. Almost every case of this kind which we saw in Belgium, seemed to afford a proof of the propriety of this rule in military surgery. It will be seen from the account which I have already given of injuries of the knee-joint, that examples of recovery, with preservation of the limb, were extremely rare; and from the number who died in consequence of the inflammation and symptomatic fever succeeding to these wounds; from the number in whom amputation could not be performed on account of the inflammation and abscesses of the thigh; and from the great difference between the success resulting from primary, and that from secondary amputation of the thigh; there seems every reason to conclude, that

many lives might be saved were early amputation uniformly practised in these injuries. In the superficial gun-shot, as well as in the slighter sabre wounds, even when the patella is injured, an attempt may be made to heal without amputation, though this attempt not unfrequently fails from the supervention of inflammation, and the formation of abscesses in the knee-joint and the parts which surround it.

Compound fractures of the arm by musket-bullets, when the bone is not extensively splintered, frequently heal without amputation, and therefore in these injuries that operation may, in favourable circumstances, be in general delayed with great propriety. But when the bullet in fracturing the humerus divides the artery, or, without dividing the artery, passes through the extremities of the bone close to the joints of the elbow or shoulder, amputation will, in most instances, be required, and great danger may be avoided by its being performed at an early period.

There are few instances in which the advantages of immediate amputation are more strikingly exemplified than in those in which bullets have passed through the cavity of the

shoulder-joint, and have fractured the articulating surfaces of the humerus or scapula. These wounds are almost always followed by very dangerous degrees of inflammation and fever, which often prove fatal. Of those who survive, the greater part require amputation at a subsequent period; and it will not appear surprising that this operation should have been found, in a peculiar degree, more dangerous than the primary amputation, when it is considered that the secondary operations must always be performed in the very middle of parts which have been recently affected with violent inflammation, and existing in the states of adhesion, ulceration, and abscess. Military surgeons are no longer deterred from performing amputation at the shoulder-joint by the fear of hemorrhage from the division of the axillary artery, for, contrary to what happens in most things, it has been found easier in practice than it appeared to be in speculation, to compress the subclavian artery over the first rib, and to put an entire stop to the passage of the blood through that vessel. The recent experience of the French and English surgeons has abundantly shewn, that amputation at the shoulder-joint, when

performed at an early period, is attended with great success, and this even in instances in which it has been necessary to remove portions of the scapula. In Belgium, almost all of those recovered who had undergone the primary amputation at the shoulder-joint, while fully one-half died of those on whom it became necessary to operate at a late period. Whether the necessity for this operation may be superseded by the division of the deltoid muscle, and the excision of the head of the humerus in the manner which has been practised by M. Larrey, is a point which must be left to future experience to determine. The number in which this operation would succeed has not been ascertained; but the length of time and care necessary to complete the cure, and the various accidents to which, during this period, the injured part must be liable, incline me to doubt whether it will be found of much utility in military practice. Punctured and sabre wounds, which merely open into the shoulder-joint, and wounds by musket-bullets, which affect only the capsular ligament, or fracture slightly the external surface of the head of the humerus, often heal without its being necessary to per-

form amputation, though, in most instances, either ankylosis, or a certain degree of lameness or stiffness of the joint, is induced.

Gun-shot fractures of the thigh have been universally allowed to be attended with a high degree of danger; indeed, till of late years, very few instances have been recorded of recovery from these injuries. Ravaton acknowledges, that, in his long and extensive experience, he had never seen an example of recovery from a gun-shot fracture of the thigh; and Bilguer, in his calculations with regard to those who recover from gun-shot fractures, sets aside those of the thigh-bone as being of a nature altogether hopeless. In the present improved state of military surgery, instances not unfrequently occur of recovery from this fracture; but of these, the number will be found, I believe, to be exceedingly small, in comparison of those who die, particularly when the fracture has had its seat above the middle of the bone. The danger which attends the gun-shot fracture in the upper part of the thigh, seems to arise from a variety of causes, among the principal of which we may reckon, the shock which the constitution receives at the moment of the

injury, the high degrees of inflammation and fever which are excited, the retardation of reunion from the great displacement and exfoliations of the fractured extremities of the bones, and the numerous and extensive abscesses which almost always form in the course of the thigh and in the region of the hip-joint and buttock.

If, in the practice of the older surgeons, amputation above the knee-joint was seldom, if ever, performed, it has become, in the progress of the art, the most frequent of all amputations. Experience has fully evinced that the thigh may be amputated in its lower part with great prospect of success ; but the danger of this amputation, like that from the injuries of the thigh, increases according to its proximity to the trunk of the body. The very frequent occurrence of fractures of the thigh-bone, and the highly dangerous or fatal symptoms to which they give rise, render it a matter of extreme importance that the advantages to be expected from amputation in these injuries should be thoroughly investigated and ascertained, so as to enable and embolden the military surgeon to carry promptly into effect those measures which, though not without danger in

themselves, may be essentially necessary for the preservation and safety of his patients. That primary amputation of the thigh is an operation greatly more successful than secondary, is a fact that has been established by the observations of M. Larrey and Mr Guthrie, and confirmed by the experience obtained in Belgium. In a great proportion, however, of the cases by which this fact has been ascertained, the operation has not been performed on account of the injuries of the thigh itself, but of the parts below it.

A series of observations, much more extensive and accurate than any we yet possess, will be required in order to enable us to determine what is the usual proportion of those who recover from fractures of the thigh-bone in its different parts by musket-bullets, and of those recovering, what proportion have the use of the injured limb. According to the observation of Percy, scarcely two of ten recover of those who have suffered gun-shot fractures of the thigh-bone. Mr Guthrie, who seems to have paid greater attention to this subject, than any preceding author, says, that "upon a review of the many cases which I have seen, I do not believe that more than one-sixth recovered so as

to have useful limbs ; two-thirds of the whole died either with or without amputation ; and the limbs of the remaining sixth, were not only nearly useless, but a cause of much uneasiness to them for the remainder of their lives. They were indeed much in the same state as Bilguer's invalids, who were incapable of any employ, civil or military.* It is much to be regretted that

* In illustration of this statement, Mr Guthrie gives the following more particular account of the result of these cases after the battle of Toulouse :—" After the battle of Toulouse, forty-three of the best of the fractures of the thigh were attempted to be saved ; having been carried from the field of battle but a very short distance, well accommodated in hospital, and attended for the most part with great care and surgical attention. Of this number, thirteen died ; twelve were amputated secondarily, of whom seven died ; and eighteen retained their limbs. Of these eighteen cases, the state, three months after the battle, was as follows :—" Five only can be considered well, or as using their limbs. Two more think their limbs more valuable (although not very serviceable) than a wooden leg ; and the remaining eleven wish they had suffered amputation at first, as they are not likely to do well ; and if they eventually recover, which, in many is doubtful, the limb will be distorted and unserviceable.' Of two officers with fracture of the femur, one died in the hands of the French surgeons, in whose charge he fell during the action, and by whom he was skilfully treated ; the other, with the greatest possible attention and care, has preserved a limb, which, I think, he will hereafter wish exchanged for a cork leg.

" In the five successful cases, the injury was in all, at, or

so little is to be found in the writings of M. Larrey on the fractures of the thigh-bone occa-

below the middle of the thigh. In the thirteen others, who retained their limbs, the injury was not above the middle third; and of those who died unamputated several were near, or in the upper third, and either died before the proper period for amputation, or were not ultimately in a state to undergo the operation. Of the seven amputations that died, two were at the little trochanter by the flap operation, and the others, for the most part, unfavourable cases. In one case only was the head or neck of the bone fractured by a musket-ball, which had entered on the outer and back part, and afterwards went through the scrotum and penis. This man was not pointed out to me for some days, and was not at that time, or ever afterwards, in a state to render amputation likely to be successful. He lived however for two months; and, from the dreadful sufferings he endured, I always regretted amputation at the hip-joint had not been performed at first.

“After other battles, in which I have had the care of fractures of the femur, the success has not been so great, but they were generally under less advantageous circumstances; and from the sum of knowledge thus acquired on many occasions, I am induced to believe, that in this injury, amputation ought to be a more frequent operation than it is at present; and I think I am borne out in this supposition by the above statements, and by the general opinion of my brethren formed during the peninsular war.

“I think it will also be conceded by those who are disposed to allow the advantage and safety of primary operations, that if the thirty-six of the forty-three who died and have only partially recovered, had been amputated on the first day, the

sioned by musket-bullets, injuries which must so often have presented themselves to his notice. Are we to infer, from his silence on this subject, that his success in the treatment of these injuries had not been very great?

In fractures by musket-bullets of the lower part of the thigh-bone, recovery not unfrequently takes place; and both Schmucker and Mr Guthrie conceive that they are injuries in which amputation may be delayed with safety. It would be very agreeable that this opinion should be confirmed by future experience; but it appears to me, that before it can be received as a maxim in military surgery, much more extensive and accurate observation than we yet possess, will be required with regard to the proportion of those who recover without amputation, or after secondary operations, and of those who recover after primary amputation. Of those who had suffered this injury, we saw, compara-

country would have had at least twenty-five stout men, able, for the most part, to support themselves by their labour, instead of five, or, at most, ten, who will not be entirely dependent upon their pensions and parishes for their subsistence.”—GUTHRIE *on Gun-shot Wounds*, p. 191. London, 1815.

tively, but a small number recovering in Belgium, and they had been attended with severe local and constitutional symptoms. Abundant opportunity was afforded of confirming the accuracy of the description of the state of a thigh-bone struck by a musket-bullet, which has been given by Mr Guthrie in the following paragraph: "If a musket-ball, in passing through the thigh, merely touch the bone, it may fracture it directly across, but it will generally do it obliquely, so as to cause some little shortening of the limb when cured under the most attentive treatment; but when a ball strikes the body of the femur, it shatters the bone in every direction, although it shall not pass through: it does not merely break off four or five small pieces, which may be taken away by cutting down upon the bone, but it breaks it into large pieces, generally oblique and very pointed, that retain their attachment to the muscles inserted into them; the fractures extend far above and below the immediate part struck by the ball, and, as far as depends upon my information from the examination of limbs that were amputated, further downwards than upwards; so that from a fracture in the middle of the thigh, I have oft-

en seen fissures extend into the condyles, and cause ulceration of the cartilages of the knee-joint; but they seldom extend upwards as high as the trochanters." This is a state of bone, it is obvious, which must be very unfavourable to recovery. It may at first give rise to dangerous degrees of inflammation and fever; and even after these have in some measure subsided, the erythematous swelling, and the abscesses which may be produced, will often render secondary amputation, the only resource which remains, extremely dangerous, if not altogether impracticable. These, and other considerations, induce me to believe that, in general, even in the fractures at the lower part of the thigh-bone, a greater number of lives will be preserved, in military practice, by immediate amputation, than by attempting to cure them without that operation. When the bone appears, on a careful examination, to be broken without being much splintered, and when the patient can be removed easily to a place of rest and safety, it may be right to attempt to preserve the limb; but if the bone be much splintered, or if the conveyance is to be long or uncertain, it will, in most instances, I am convinced, be a much

safer practice, even in fracture of this part of the thigh-bone, to amputate without delay.

Musket-bullets, in passing through the femur near to the knee-joint, produce fissures of the condyles, which generally communicate with the joint. These cases, like those in which the bullets have passed directly through the joint, require immediate amputation.

The writings of military surgeons contain but few histories of cases in which the thigh-bone had been fractured above its middle by the passage of musket-bullets. These are cases, I believe, which have generally had a fatal termination; and the danger attendant upon the amputation which they require, seems long to have deterred surgeons from attempting to ascertain what advantages might be derived from the employment of that operation. Schmucker recommends, and states that he had practised with success, immediate amputation in those cases in which a sufficient space was left below the groin for the application of the tourniquet. It is curious to remark, in the history of amputation, how long surgeons were in discovering the ease and safety with which the femoral artery may be compressed by the fingers or pads, in its

passage over the brim of the pelvis. Boy, from the immediate danger, protracted suffering, and ultimate want of success which he had observed to follow this kind of injury, urges strenuously the propriety of immediate amputation, and reprobates, in the strongest terms, the conduct of those surgeons who, in declining the responsibility which is attached to the performance of a dangerous, though necessary operation, sacrifice the safety of their patients to the selfish regard which they have for their own reputation. Mr Guthrie's opinion with regard to the dangerous nature of these injuries, and the advantages to be derived in them from immediate amputation, coincides in every respect with those of Schmucker and Boy. He observes, that those whose thigh-bone has been fractured in its upper part by a musket-bullet, generally die with great suffering before the end of the sixth or eighth week; and that few even of those escape in whom that bone has been fractured in its middle part. Of the few whom we saw who had survived gun-shot fractures in the upper part of the thigh-bone in Belgium, scarcely any one could be said to be in a favourable condition. In all, the limbs were much contracted, distorted, and swollen, and abscesses had form-

ed round and in the neighbourhood of the fractured extremities of the bones. In some instances, these abscesses had extended down the thigh; but more frequently they passed upwards, and occupied the region of the hip-joint and buttocks. In several instances in which incisions had been made for the evacuation of matter, the fractured and exfoliating extremities of the bones sometimes comminuted, and sometimes forming the whole cylinder, could be felt bare, rough, and extensively separated from the soft parts which surrounded them. In other instances, these extremities were partially inclosed in depositions of new bone, which, from the quantity thrown out, seemed to be present in a morbid degree. It was obvious that in all of these cases several months would be required for the reunion of the fractured extremities; that in some much pain and misery were still to be endured from the processes of suppuration, ulceration, exfoliation, and ejection of dead bone; that in some cases the patients were incurring great danger from hectic fever and from diarrhæa; that the ultimate recovery in most of them was doubtful, and that of those in whom this might take place, there

was but little probability that any would be able to use their limbs. The sight of these cases made a deep impression upon my mind, and has tended to increase my conviction that this is, of all others, the class of injuries in which immediate amputation is most indispensably required. The operation, it must be allowed, is necessarily accompanied with danger; but the usual fatality of these injuries when left to themselves, and the impossibility of performing secondary amputation with any rational prospect of success, give us every reason to believe that many lives would be saved by immediate amputation, and much pain and suffering would undoubtedly be prevented by that practice.

What has been said of the danger of the fractures produced by musket-bullets in the upper part of the femur, is true in a still greater degree of those which have their seat in the neck or head of that bone. These are injuries which the experience of all surgeons has shewn to be so highly dangerous in their nature, as to render any operation or means of cure extremely desirable, that shall hold out even a chance of life to the unfortunate sufferers.

The success which had been observed to attend the excision of the arm at the shoulder-joint, the casual observation of the separation by mortification of the inferior extremity at the hip-joint, and the successful results of amputation performed in this joint upon quadrupeds, all tended gradually to inspire surgeons with the belief, that it might be possible to take off the thigh with safety in the place of its articulation with the body. Amputation at the hip-joint is not one of those random operations which has been discovered, as it were, by accident, or to which recourse has been had from sudden impulse in a moment of despair, but one, the contemplation of which seems in a remarkable manner to have fixed the attention, and exercised the ingenuity of surgeons in the invention and improvement of the means by which it might be most easily and safely accomplished. Accordingly there is not, I believe, in the history of surgery, an example of any operation, the dangers and difficulties of which had been so minutely investigated, and so deliberately considered, as those of amputation at the hip-joint; nor of which so many plans had been devised, and so many imitations tried on

the dead body, before an attempt was made to perform it upon the living. Whether, therefore, this operation, which seems to fix the utmost possible limits to the benefits that men wounded in their limbs can ever receive from operative surgery, shall be adopted as a last but salutary resource, or rejected as a dangerous and hopeless remedy, still it must remain in its intention, plan, and execution, a proposal which reflects honour on all who have been concerned in its improvement.

Morand seems to have been the first surgeon who directed his attention, in a particular manner, to the operation of amputation at the hip-joint. In the year 1739, two of his pupils, Volher and Puthod, separately communicated memoirs on this subject to the Royal Academy of Surgery,* in which they point out the various injuries and diseases for which they regarded amputation at the hip-joint to be the only resource. They each of them give a regular and detailed plan of the operation, and endeavour to obviate

* *Opuscles de Chirurgie*, par M. Morand. A Paris, 1768, premiere partie, p. 176.

the different objections which might be made to its performance.*

Ravaton, in 1743, wished to have performed amputation at the hip-joint upon a soldier who had suffered a gun-shot fracture of the trochanter major, and neck of the thigh-bone, but was prevented from carrying his design into effect by the opposition made to it by some of his professional brethren. He has given a plan of the operation, which must be difficult to execute, and applicable but to few, if to any, of the cases in which it can be required.† L'Alouette, in a thesis printed at Paris in the year 1748, strongly recommended a trial of this operation, and endeavoured to encourage surgeons to perform it by relating the results of experiments made upon the dead body, which seemed to shew, that after the femoral artery had been secured by ligature, no very dangerous hemorrhage could occur from the division of the other

* Idem, p. 189 and 199.

† Chirurgie d'Armée, p. 323 à 331. Examen de Chirurgie, par M. Bagieu. Tome I. p. 201.

blood-vessels.* In 1754 the Royal Academy of Surgery, desirous to procure for this operation the attention which its importance appeared to merit, proposed as the subject of a prize-essay for the year 1756, the discussion of the following points:—" Dans le cas ou l'amputation de la cuisse dans l'article paraîtrait l'unique ressource pour sauver la vie á un malade, déterminer si l'on doit pratiquer cette opération, et quelle seroit la méthode la plus avantageuse de la faire." In answer to this question, twelve memoirs were transmitted to the Academy, but none of these having been judged worthy of the prize, that learned body again proposed the discussion of the same points, as a double prize, for the year 1759. This produced no fewer than thirty-four competition essays. In more than two-thirds of these, their authors expressed themselves in favour of the operation, and the Academy appears to have given its sanction to the proposal, by adjudging the prize to the memoir of M. Barbet.† This author dis-

* *Disputationes Chirurgicæ selectæ Halleri*, tom. 5, p. 265.

† *Prix de l'Académie*, tom. 8, p. 101—*Idem*, tom. 9, Preface, p. viii.

cusses with much good sense the practicability and immediate safety of the operation, and gives a very judicious account of the injuries and diseases in which he conceived amputation at the hip-joint to be the only resource, as well as of those in which it appeared to him that this operation would be useless or impracticable. He gives general rules for the performance of the operation, but the particular plan, he justly remarks, must be varied according to the nature and circumstances of the cases in which it is required.* Besides the memoirs presented to the academy, two others were published at Paris; one by M. Goursaud in 1758, which contained a proposal of a new method for performing the operation, and the second a laboured and well-digested essay by M. Moublet, inserted in the *Journal de Medicine*, for the year 1759, in which the operation is very ably considered in all its different relations.

Though after this period, amputation at the hip-joint began to be described in systematic books of surgery, a considerable time elapsed

* *Prix de L'Academie*, tom. 9, p. 1.

before a trial of it was made upon the living body ; for we ought not to regard as such those cases in which, in consequence of mortification of the lower extremities, a closure of the femoral arteries, and a separation of almost the whole of the soft parts surrounding the hip-joint had been effected by nature. The two cases of this kind mentioned by Sabatier, and which have so often been referred to as examples of amputation at the hip-joint, were obviously cases in which the separation of all the parts which it is dangerous to divide had been accomplished without the aid of the surgeon.*

It is a remarkable fact in the history of surgery, that an operation, which had been invented in France, and concerning which so much had been written in that country, should have been first actually carried into practice in England. I have been informed that the operation was performed in London by the late Mr Henry Thomson, surgeon to the London hospital, and imagine that it must have been his operation to which Mr Pott alludes in the following

* De la Medicine Operatoire, par M. Sabatier, 2de edition, Paris, 1810, tom. 3, p. 422.

paragraph: "That amputation in the joint of the hip is not an impracticable operation (although it be a dreadful one) I very well know: I cannot say that I have ever done it, but I have seen it done, and am now very sure I shall never do it unless it be on a dead body. The parallel which is drawn between this operation and that in the joint of the shoulder will not hold—In the latter it sometimes happens, that the caries is confined to the head of the os humeri, and that the scapula is perfectly sound and unaffected. In the case of a carious hip-joint this never is the fact; the acetabulum ischii, and parts about, are always more or less in the same state, or at least in a distempered one, and so indeed most frequently are the parts within the pelvis—A circumstance this of the greatest consequence; for the power of performing the operation beyond the seat of the disease, and consequently of totally removing all the distempered parts, is the very decisive circumstance in favour of amputation every where but in the hips, where (to say nothing of the horridness of the operation itself) the hæmorrhage from a multiplicity of vessels, some of

which are of considerable size, and the immense discharge which a sore of such dimensions must furnish, the distempered state of the parts, which cannot by the operation be removed, will render it ineffectual, bold and bloody as it must be."* But whether this conjecture be well or ill founded, certain it is that amputation at the hip-joint was performed in a case of disease of that joint about the beginning of the year 1779, by Mr Kerr of Northampton, and an account of it published in Dr Duncan's Medical Commentaries for the same year.† A case more unfavourable to the success of the operation can scarcely be imagined than that in which Mr Kerr operated; yet his patient not only bore the operation without sinking, but appeared to recover till about the tenth or eleventh day, when she was seized with a fever which proved fatal on the eighteenth. The wound continued to have a good appearance, even to the last, though on dissection it was found that this patient, besides the

* Chirurgical Works, London, 1779, vol. 3, p. 412.

† Medical Commentaries, vol. 6, p. 337.

disease of the hip-joint, had been affected with phthisis and lumbar abscess. The result, however, of the operation in this case was extremely valuable, in as much as it shewed that the fears which had been entertained of immediate danger from its performance were groundless, and that an expectation of recovery from amputation at the hip-joint might reasonably be entertained in cases of a more favourable nature. How different the impression was, which this operation left on Mr Kerr's mind, from that produced in Mr Pott's by the case which he had witnessed appears from the following sentence, with which Mr Kerr concludes his account of the case in which he had performed it:—"With regard to the expediency of the operation, I am so much convinced of it in certain cases that I shall not for the future hesitate to perform it when they occur."

M. Larrey was the next surgeon who had the courage to perform this severe operation. He has the merit also of having introduced amputation at the hip-joint into military practice, and of having persevered in his attempts to render it useful, notwithstanding the unfortunate termination of the first five cases in which he ope-

rated.* One of these patients appeared to recover till the seventh day, when an attack of the plague proved fatal; and in the others, there seemed every reason to believe that the death was the consequence of the injury for which the amputation had been performed, and of the unfavourable circumstances in which the patients were placed, rather than of the operation itself. These cases afforded an additional proof that the operation is attended with no immediate danger to life, and there can be little doubt that the result obtained from its performance by M. Larrey, though in many respects unfavourable, encouraged other surgeons to give it a trial.

Since the publication of M. Larrey's cases, amputation at the hip-joint has been performed in a variety of instances by different surgeons, in several of which it has been attended with complete success. In the beginning of 1812, M. Baffos, surgeon in Paris, performed this operation on a boy seven years of age, of a scrophulous constitution, on account of an exostosis in the

* *Relation Historique et Chirurgicale*, &c. Paris, 1803, p. 319. *Memoires de Chirurgie Militaire*, a Paris 1812, tom. 2, p. 180, tom. 3, 349.

upper part of the right femur.* This patient suffered a considerable degree of pain, but had little fever from the operation. The wound had healed, and his health appeared to be restored, when about the sixty-third day fever and diarrhea came on, the cicatrix opened, and he died at the end of the third month. On dissection the right ilium was found affected with caries, a disease which had probably existed before the performance of the operation. My friend Mr Brownrigg, surgeon to the forces, who had several times performed amputation at the hip-joint without success, obtained a complete cure by an operation performed in December 1812, on a man who had, twelve months before, suffered a gun-shot fracture of the upper part of the thigh-bone.† In a case in some respects similar to Mr Brownrigg's, in which Dr Emery operated, the patient lived to the thirtieth day, although previously to the operation he was reduced by the disease to the most deplorable and hopeless condition.‡ We are informed by Mr

* Bulletins de la Faculté de Médecine de Paris, tom. 3, p. 71.

† Guthrie, p. 163.

‡ Idem, p. 145.

Guthrie, that M. Larrey again performed this operation twice during the Russian campaign, and was rewarded for his meritorious exertions by the successful result of these cases ; for notwithstanding the rigour of the climate, and the privations and hardships to which they were exposed, one of his patients continued to recover till the thirty-fifth day, when he was attacked by a fever and dysentery which proved fatal ; and the other was seen at Witterp, on his way to France, completely cured, three months after the operation had been performed.*

In addition to the cases already mentioned, amputation at the hip-joint was in two instances performed in Belgium. In one it was performed by my friend Mr Blicke, surgeon to the forces, on a patient two months after the injury had been received, in whom, in consequence of a contusion of the femur by a musket-bullet, inflammation of the bone had taken place, and abscesses had formed along the thigh, accompanied with severe pain and great loss of strength. This man survived the opera-

* Idem, 125.

tion eight days ; his sufferings were much relieved, and his condition seemed to be improved by it. In the other instance, the operation was performed by Mr Guthrie on a man who had been wounded twenty days before by a musket-ball, which had entered the great trochanter, passed through the neck of the femur, and had come out anteriorly about four inches below the groin. Previously to the operation this man's strength was greatly exhausted ; his wounds had put on a sloughing appearance, and an extensive bed sore had formed over the sacrum ; yet notwithstanding these unfavourable circumstances, a complete cure was ultimately obtained. The more minute detail of this case I must leave to Mr Guthrie himself. It cannot fail to add to the value of the very full and useful account which he has given of amputation at the hip-joint.

From this statement it will appear that five of the cases which have been mentioned ought to be regarded as recoveries from amputation at the hip-joint ; for though one of the patients last operated on by M. Larrey, and that operated on by M. Baffos, both died, any injurious effects which can be supposed to have resulted

from the operation had ceased before death took place, which in both instances seemed to have arisen from circumstances unconnected with the amputation. I am inclined to believe that the same remark holds true with regard to the cases operated on by Dr Emery and by Mr Kerr, for in neither of these cases did the death appear to be owing to the operation, but to the progress of the disease on account of which it had been performed.

In three instances, one operated on by Mr Brownrigg, one by M Larrey, and one by Mr Blicke, the patients lived to the eighth day, affording additional confirmation of the opinion that this amputation may be performed without any immediate danger.

In the other instances, ten or eleven in number, in which amputation at the hip-joint has been performed, death has taken place at a much earlier period, most of the patients appearing to have survived the operation only a few hours. It will be seen, however, from an examination of those instances of which the circumstances have been recorded, that the speedy death can be accounted for by the state of the patients in which the operation was performed, and that,

from the nature of the injury and severity of the symptoms, a recovery could not be reasonably expected. In some of these cases the operation was performed at the urgent request of the patients or their friends when the circumstances were such as to render it a completely hopeless resource. Every trial of this sort, in the introduction of a new operation, is perhaps to be regretted, because failure, even in those instances in which success is not to be expected, is liable to do harm by creating prejudices against a means of cure which might be found beneficial were it employed in cases better adapted for its use. In reflecting upon the nature and usual termination of the cases in which this operation has been performed, we have reason to be surprised at the degree of success which has attended it; and we have good grounds to hope that when the kind of injury and circumstances in which the operation can be useful are better discriminated and ascertained, amputation at the hip-joint will not differ much in success from that which has been found so useful, and which is so often required, in wounds of the middle and upper part of the thigh. In anticipating the benefits likely to be derived from amputation at

the hip-joint, it may be useful to remember how long surgeons were in obtaining the advantages from the amputation at the shoulder-joint which that operation now daily affords.

Amputation at the hip-joint should, if possible, be performed before inflammation supervenes, because if delayed, few patients will live to the proper time for the secondary operation; and of those who may survive, the state of the wounded parts, and the injury which the constitution must have suffered, will render its performance more difficult than at the primary period, and the result less favourable.

It seems doubtful how far benefit can in general be expected from the employment of amputation at the hip-joint in cases in which the limb has been carried off high in the thigh, or in which the soft parts surrounding the joint have been extensively lacerated and contused, and the bones injured by cannon-balls or large pieces of shells; for these are injuries which produce a shock to the general constitution from which the patient seldom recovers, but sinks either immediately or in a few hours after it has been received. This is a state in which the operation must in general be useless,

if not injurious. If, however, as sometimes happens, this shock should not be so great as to preclude the hope of success, or if it can be removed or diminished by the use of cordials or other appropriate remedies, or if the patients are suffering violent pain and uneasiness from their wounds, it may be right to perform the amputation as the only means of saving the life or of giving relief; though in these cases the same degree of success is not to be expected as if the parts about the joint had been less injured, and the state of the general constitution more favourable. It is, however, unhappily in this class of cases, that the operation has hitherto been most frequently performed.

The kind of wound for which immediate amputation at the hip-joint appears to me to be best adapted, is one in which it has not, so far as I know, been practised or recommended. I allude to that in which a musket-bullet or grape-shot, or a small portion of shell, has been observed to fracture the neck of the thigh-bone, or to fracture the head of that bone, and pass through or lodge in the hip-joint. The proportion of cures which has been obtained from am-

putation at the hip-joint is, I believe, much greater than of cures from gunshot fractures of the head or neck of the thigh-bone. Indeed, of recoveries from these injuries I know of none which have been recorded. Those, who for a time seem to do well, in the end sink under the hectic which supervenes. This has been the fate, I believe, of the two cases which I have mentioned in the account of injuries of the hip-joint as having put on a favourable appearance. It seems therefore highly probable, that in the fractures by musket-bullets of the neck and head of the thigh-bone, the practice of amputation at the hip-joint will become the means of saving many lives; and we cannot but expect that the results from amputation in these cases will be found much more successful, than in the class of cases in which it has hitherto been employed, since the local and constitutional injuries at first occasioned by musket-bullets, are comparatively small with those which occur in the more severe wounds produced by cannon-shot.

When in fracturing the bone, a musket-bullet has divided the femoral artery, or some of the

primary branches of the posterior iliac, or profunda, the wound is rendered more immediately dangerous. This has been considered by Mr Guthrie as the principal case of a wound by a musket-bullet, which will render amputation at the hip-joint necessary. In such an injury, this operation certainly is the only means in our power of preserving the life of the patient, but it is not likely to be so advantageous as in the injuries of the bone or joint without the division of the blood-vessels. In almost all the cases which have been observed of division of the larger blood-vessels of the groin, immediate death from bleeding has been the consequence. In those instances in which this may not take place, the debility induced by the loss of blood will render the patient less able to bear the operation; or in the event of the continuance of the bleeding, it may become necessary to perform it before the patient has sufficiently recovered from the shock which he has sustained, to permit it to be done with safety.

In a case, where besides fracturing the neck or head of the femur, the ball has entered the cavity of the pelvis, the operation can be perform-

ed with but little prospect of success, though, in particular cases, it may be the only means of affording a chance of life to the patient.

In those instances in which, with the fracture of the femur, the bullet is found to have fractured the acetabulum, or external surface of the pelvis without entering its cavity, the operation is more likely to be useful than in the preceding case. From the exfoliation of bone, however, which must necessarily take place, the cure may be rendered tedious and doubtful.

How far it might be proper or necessary to perform immediate amputation in those instances in which a bullet has opened the capsule of the hip-joint, or wounded the neck of the thigh-bone without fracturing it, must be left for future experience to determine. These are injuries, which in very favourable cases may terminate by ankylosis, but which, much more frequently, I believe, produce incurable suppuration, ulceration, and caries of the hip-joint.

Secondary amputation at the hip-joint may become necessary, 1st, In the cases already mentioned, when, from any cause the primary

operation has been deferred or neglected, and the patient has survived the inflammatory attack.

2. In cases of slight injuries of the joints, which either had not been perceived at first, or in which an attempt at saving the limb had been made, but in which, disease of the joint and hectic fever have supervened ; or in wounds in the vicinity of the joint, from which disease has been communicated to its cavity.

3. In fractures in the course of the thigh-bone, or in contusion of that bone in which incurable disease has extended along the thigh to the joint.

And, 4. In cases of dangerous hemorrhage with ulceration or sloughing of soft parts, or of incurable disease of the bone, supervening to amputation performed high in the thigh.

THE author regrets that by unavoidable circumstances he should have been compelled to delay so long the publication of the preceding

Report, and still more that he should feel himself at last obliged to send it abroad in an unfinished and imperfect state. Several points of great practical importance connected with the subject of amputation, still remain to be considered, but the discussion of these requiring more time than he can at present spare from his other engagements, he finds himself under the necessity of deferring this till some future opportunity. He is well aware that an additional interest might have been given to the Report by a minute detail of individual cases ; but this he has avoided, lest he should have anticipated or interfered with any intentions of publication on the part of the medical officers who were entrusted with the care of the wounded.

It is impossible for the author, however, to let these pages appear without availing himself of the opportunity which they afford of expressing to the medical officers who were employed in the military hospitals in Belgium, his most grateful acknowledgements for their uniformly kind attention in pointing out to him the cases of the wounded men under their care, and in explaining to him so unreservedly the grounds and reasons of their practice. He has only further to

add, that he will feel himself infinitely obliged to these gentlemen for any correction of mistakes into which he may have inadvertently fallen in his statements, and particularly for the communication of any remark, observation, or case relative to the local and constitutional effects of amputation, which may assist him in drawing up the remaining part of his Report,

FINIS.

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